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ABSTRACT

Described are the construction and analysis of three play learning centers for preschool mentally retarded and cerebral palsied children, and pre-adolescent and adolescent emotionally disturbed children. Section I of the report provides an introduction on the importance of play, research on playground equipment, considerations in designing play learning centers, and existing playgrounds designed for the handicapped. Presented in Section II is information on such construction aspects as framing materials, surface coverings, materials for fastening, and recommended tools. The following three sections discuss the design process, construction and construction costs, recommended materials, and descriptive data on facility use for each of the three play learning centers: United Methodist Preschool Play Learning Center for mentally retarded children, United Cerebral Palsy Play Learning Center, and the Residential Treatment Center for emotionally disturbed children. A brief section on recommendations for further research is also included. Appended is the program for information dissemination associated with the play learning research and demonstration project, a playground design checklist, and detailed construction plans for each of the three play learning centers. (SB)

PLAY LEARNING CENTERS FOR PRESCHOOL HANDICAPPED CHILDREN

EMONSTRATION PROJECT REPORT

PLAY LEARNING CENTERS

FOR

PRESCHOOL HANDICAPPED CHILDREN

RESEARCH AND DEMONSTRATION PROJECT REPORT

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PREFACE

The project director's involvement in this research and demonstration project evolved as a result of his efforts over the past two years in the production with William Buxton of a documentary film entitled, "How to Blow Up a Playground." The observations of the limitations and dangers inherent in traditional playground equipment for all children, but particularly for handicapped children combined with the realization that alternative designs for playgrounds were possible, led to the initiation of this project. Experience in designing, constructing, and supervising a playground in Central Park Village of Tampa not only convinced the project director that designing and constructing a relatively inexpensive outdoor play area to meet the special needs of preschool handicapped children was possible, but that systematic observations and analysis of the children's response to the play apparatus was crucial.

As a result, a research and demonstration grant proposal was submitted to the Bureau of Education for the Handicapped, of the U.S. Office of Education, which envisioned the designing, constructing, and evaluation of three play-learning centers for preschool handicapped children. Subsequent events made it necessary to shift from a preschool population at the Florida Mental Health Institute of Tampa to a population of pre-adolescent boys at the Residential Treatment Center of Tampa. The proposal was funded for a total amount of $72,000 with a beginning date of September 15, 1974, and an ending date of September 14, 1975.

In addition to this comprehensive written report of the research project, a booklet, 35 mm slide presentation, and 16 mm color-sound film will be prepared in order to effectively communicate the results of this project to those interested educators and parents of handicapped children.

ACKNOWLEDGMENTS

The Project Director wishes to acknowledge the contributions made to the success of this research and demonstration project by a number of persons.

Initially, recognition is highly deserved by the project staff which included Barry M. Silverstein, research associate, and research assistants, Sandra Bird, Glenn Holstman, and Ginger O'Neal who were importantly involved in the design, construction, and evaluation of the three play learning centers. Among Mr. Silverstein's valuable contributions to the project were model building, drawing plans, procuring construction materials, constructing the play centers, producing still photographs of the entire project, videotaping children's play, analyzing videotapes, and assisting in the production of written and visual reports of the project. In addition to responsibilities in designing, constructing, and evaluating the three centers, Ms. Bird was responsible for the supervision of play activities of the children at the Cerebral Palsy Center, Mr. Holstman was the supervisor at the Residential Treatment Center, and Ms. O'Neal was the supervisor at the United Methodist Preschool Center.

A special acknowledgment and thanks go to Mrs. Jo Aaron for her accurate and up-to-date budgetary accounting and excellent typing which kept the project within its resources and provided clear communications of our efforts.

The cooperation and enthusiasm of Mr. Peter Halpin, Executive Director of the Cerebral Palsy Center, Ms. Betsy Rice, Director of

Acknowledgments (continued)

the United Methodist Preschool Center, and Dr. Wilson Rippy, Director of the Residential Treatment Center and their respective staffs made the project not only successful, but a most enjoyable one as well.

Mr. Mel Appell and Mr. Bill Hillman, Bureau of Education for the Handicapped Project Officers, provided meaningful suggestions during their site visit of June, 1974 and continued professional technical assistance throughout the project.

Lastly, thanks to all the children at each of the three centers who in their individual ways provided us the opportunity to record and describe their free, creative, enthusiastic and joyful play.

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The Importance of Play

The play of children is universally characterized by spontaneity, freedom, creativity, discovery, and joyfulness. It can be observed that young children do not wait for a specified time to play, but rather seem to initiate at every opportunity voluntary play activities as an important part of experiencing and discovering life. The play and developmental experiences of children form a continual and integral process and become a desired and important research activity through which self is explored in relationship to the world.

Play and work are not necessarily opposite terms except perhaps in the way in which each is measured or is experienced by the performer. Work can be measurably quantified in regard to an amount of effort or power; whereas play can be measured on a value scale relative to the degree to which it is desirable, pleasurable, and rewarding. Thus, work which meets the above definition of quantified effort could also be play to the individual experiencing it. Unfortunately, because play does not result in a product which can be classified, measured, or sold, it is looked upon as an outlet for the "surplus energy of children." Many adults, therefore, view play as being frivolous and unimportant. At best, it is viewed by many adults as a means of killing time until such time as the child can get to the important tasks of work and/or learning.

Piaget (22) has suggested that much of what we call play is really the active process of the development of intelligence of children. He divides play and games into functional play, symbolic play, and games with rules. He suggests that functional

play involves the sensory motor explorations of very young children; whereas symbolic play occurs when representative symbols are substituted for a real object. He observes that games which include rules occur when children are able to verbalize, relate to others, and follow rules. Through the serious business of play, children experientially learn what no one else can teach them. Young children do not differentiate between play and learning, but rather view both as a continuous, integrated and pleasurable process.

Children, through play experiences, are not only mastering their neuromuscular interaction with the physical worlds, but are also learning to live in our symbolic culture. In real and imaginative play, the child is able to create a secure and manageable microcosm of the complex adult world. In this he is able to manipulate a variety of materials, objects, and symbols in discovering their relationships to each other and to society.

Research points to play as an effective and positive medium for the physical, mental, and social development of children. Those children who are classified by our society as being handicapped can also develop through the medium of play. However, due to their special developmental needs it would seem most desirable to provide opportunities for an abundance of play experiences in a physically safe and psychologically secure environment. Since these children with special needs basically follow the same patterns of development as all other children it is important that the quantity and quality of play experiences necessary for optimum development be made accessible to them.

Research on Play Equipment

An examination of the descriptive research concerned with the utilization of play apparatus by all children, including those considered to be handicapped, indicates vast areas yet to be explored.

The relatively small number of studies conducted in this area to date reflects perhaps both the small importance society has assigned to play for young children, the low priority educators have given it, and the difficulty of structuring a research study so that it does not violate the spontaneity of play.

The play apparatus found on most playgrounds in the United States traditionally includes swings, slides, teeter-totters, merry-go-rounds, and jungle gyms. Mahajan (19), of the Consumer Product Safety Division of the National Bureau of Standards, indicates that more than 800,000 emergency-treated injuries, involving playground equipment, occur each year. Approximately 57 percent of these injuries result from the attempted use of home playground equipment, whereas the remaining 43 percent occur on school and community playgrounds. One half of the total number of playground accidents reported were attributed to inappropriate use of playground equipment by the children. No information is provided concerning possible injuries sustained by handicapped children in attempting to play on playground apparatus. As a result of the above statistics, a study was undertaken by the National Bureau of Standards in an attempt to establish safety standards for home playground equipment. The results of the study pointed out that it is presently difficult to establish safety standards for home playground equipment due to the limited

information available. However, it was concluded that interim standards for structural durability, safety design, and a program of playground consumer education are needed to reduce the number of accidents.

While interim standards are important, the single usable design of traditional equipment may have an even more important, although indirect, effect on the number of accidents experienced by children who attempt to move creatively on play apparatus. When traditional play equipment is analyzed regarding its utilization by children, we find many hazardous situations. For example, teeter-totters and swings allow for safe movement only in a vertical and/or horizontal plane. When children move on either of these apparatus in a way different from the singular use intended by the designer, their safety is in jeopardy. Since both pieces of apparatus accommodate a relatively small number of children, those children waiting their turn many times become those injured by a moving teeter-totter or a flying swing. In addition, if a child slips while balancing on the cross beam of a teeter-totter or is hit by one of its moving boards, the severity of the injury sustained is magnified by the structural design of the equipment. The traditional slide is perhaps a more explicit example of the inadequacy of current playground design. The steps leading up to a ten-foot high slide allow very young children to climb to the top, but the small platform at the top and narrow slide also provide for an easy, but dangerous, fall.

Also inherent in the design of traditional playground equipment are the potential negative psychological effects on children

relative to the development of spontaneity, creativity, and discovery on play equipment which severely limit the number of ways in which a child can safely respond. While no formal studies have been reported concerned with answering the questions of the effects of this one-dimensional design on the physical safety and psychological development of children, a few studies have looked at the degree of utilization of traditional playgrounds by children.

Dee and Liebman (7) report the average attendance per day, exclusive of evenings and nights, on selected playgrounds of the City of Baltimore was twenty persons per day. They also reported a negative relationship between attendance and the presence of swings and slides on the playground. Wade (28) further reports that the average amount of time spent per day by children on a single daily visit to traditional playgrounds in the City of Philadelphia was fifteen minutes. The apparatus on these playgrounds which consisted of swings, slides, see-saws, and merry-go-rounds were idle at least 88 percent of the time during hours in which they could have been in peak use.

Based on the observations of this author of traditional playgrounds, over a period of time, unfortunately the above studies seem to be representative of conditions as they currently exist. There is little indication that traditional playground apparatus can offer the variety of movement experiences necessary to sustain the interest of non-handicapped children on a continuing basis, much less meet the special needs of handicapped children.

Indeed, it is questionable whether any playground apparatus will sustain the interest of children for prolonged periods of

time unless it provides for an infinite variety of movements or is capable of being manipulated by the child.

One such approach which meets the latter criteria is the Adventure Playground Concept which originated in Denmark over 35 years ago. In the Adventure playground, an outdoor setting is provided in which children are allowed and encouraged under the supervision of an adult play leader to build their own playground. Tools and scrap materials are provided and imaginative play apparatus, many times, allows for the performance of swinging, sliding, balancing, and jumping-type activities by the children. After utilizing the structures for play, the children modify or completely reconstruct the play environment to accommodate their new interests. Thus, an ever-changing play area is periodically created by and for the children who utilize it. Not only have Adventure Playgrounds been built in England and the United States, by non-handicapped children, but Hurtwood (17) reports an Adventure Playground which was opened in February, 1970, has successfully served an average of 500 physically, mentally, and emotionally handicapped children per week.

Currently, there are seven million school-aged children in the United States who are described as being either physically, intellectually or emotionally handicapped. While one might agree that these children could be absorbed into presently existing school facilities with minor modifications, the traditional playground equipment in these schools would require major redesigning. Perhaps, because it is so readily observable, the degree of utilization of playgrounds by handicapped children has not been systematically documented. The physically handicapped child is many

times excluded due to obstructions leading to or barriers inherent in the design of playground equipment. The special needs of visually handicapped children have not been considered in the design of most playground equipment. Additionally, designers have not provided for the multiple needs of multiple-handicapped children. Children who are mentally retarded, learning disabled, emotionally disturbed, or auditorially handicapped perhaps are less penalized in their use of playground equipment. However, this usage is at best minimal when one considers the meager use of playground equipment by all children non-handicapped and handicapped alike which was documented earlier.

If we conclude that existing playground equipment should be improved or redesigned, the next concern becomes one of identifying what is known about the interaction of children in play with regard to the color, size, texture, shape, and position of play apparatus. While the research directly related to this question is not extensive, the following studies form a basis for further needed research.

Studies of abstract color preferences of children by Burnham, Hanes, and Bartleson (4) indicate that 4 and 5-year-old children are in the process of changing their preferences from warm colors, such as red and purple, to cool colors, such as green and blue. The study raised the question as to whether abstract color preferences are predictive of the effects of color on the play behavior of pre-school children was not clear. However, another study by Witt and Gramza (29) recorded the behavior of 4 to 5-year-old children while playing with red, blue, green, and gray colored blocks which were presented in varied spatial arrays.

There were no significant preferences by the children for any one of the four colors presented nor was there any preference difference between sexes. The study suggested that abstract color preferences may not be a reliable predictor of the selection of colored play objects. Children further clearly selected piles of blocks at either end of a semicircular arrangement despite rotating the groups of colors. Thus, position of the play object was more important than the color in their selection by the children. In another study by Gramza, Witt, Linford, and Jeanrenaud (10), mongoloid children displayed no significant preference for either color or position in the utilization of blocks.

Surprisingly few investigative studies of the importance of the amount or position of larger play equipment related to its usage by children in a play situation have been reported.

Wade (28) reported no significant difference in the activity level of children in a heavily-equipped play room and a sparsely-equipped one.

Witt and Gramza (29) concluded that the play trestle which occupied the center position in a playroom received the most use by children and that a large trestle was more appealing than a smaller trestle when placed in the center position.

Considerations in Designing Play Learning Centers

Unfortunately, there is limited firm or applicable research information regarding the play response of children to various colors, textures, size, and shape in designs of play apparatus. As stated earlier, the child's play, development, and learning is a continuous and integrated process. Therefore, the outdoor play environment should be related to and be an extension of the educational goals of the classroom. Thus, if the developmental playground is viewed

as such there are other considerations which can serve as a bases for designing a play learning environment for children. Among these important factors related to planning and constructing play learning centers are the motor developmental needs of children, safety considerations, and opportunity to play creatively. In addition, there are concerns under the general categories of utilization of available land space, the surrounding environment, cost of materials and construction, and aesthetic qualities.

As mentioned earlier an important consideration in designing any play equipment must be on the characteristics and developmental needs of the children who will use the equipment. This approach views children as possessing needs for certain experiences and displaying common behaviors which are inherent in a positive developmental process and designs apparatus accordingly. This is in contrast to designing equipment with the expectation that the basic needs of children and/or their behavior will be changed.

Numerous physiological studies have firmly established the need of the growing child for vigorous muscular contraction via large muscle activity in order to maintain and/or increase muscle size and strength. It is also important to recognize that the anatomical structure of the human body is such that an extensive range and variation of movements is necessary in order to achieve total muscular activity and development.

In addition to the need for a variety of vigorous movements for maintenance and development of muscular strength and endurance, the growing child also requires sensory motor experiences for the achievement of control and coordination of movements of the body.

Engagement in physical activity in which there is vigorous contraction of muscles in moving the body up, over, down, under, and through a variety of environmental challenges is both necessary and enjoyable to the young child. Thus, basic movements such as rolling, crawling, climbing, walking, leaping, jumping, balancing, running, swinging, and sliding are natural and important expressions in the play of children. The rate and level of motor development in handicapped children is often times slower than that of the non-handicapped child of the same chronological age. However, the sequence of motor development is basically the same for both groups of children. Thus, handicapped children need and enjoy experiences in performing the same basic movements as other children. The positive environment should be one which stimulates and provides for a variety of movement patterns, alternative ways to move from one point on the apparatus to another, and safety for all children who use it. The special needs of some handicapped children also have to be further considerations in the design of all play equipment intended for public use. One of the purposes of this research and demonstration project is to identify and discover specific needs of pre-school handicapped children related to the designing of play environments. (The Playground Design Checklist included in Appendix C provides more detail concerning the characteristics of a quality playground).

Existing Playgrounds Designed for the Handicapped

In addition to basic laboratory research, several recent field-action research and/or demonstration projects have been identified. In 1972, the development of a therapeutic playground for pre-school handicapped children was reported by Gordon ( ). The [illegible]

Developmental Playground, located at the Institute of Rehabilitation Medicine of New York University Medical Center, was funded by the U.S. Office of Education and designed by Architect, Richard Dattner to meet the physical developmental needs of preschool children with orthopedic or neuromuscular handicaps. The four major areas of the playground include a bridged treehouse, foam and sand pits, sand and water tables, and a grassed hill. The playground can be used by children who can walk and by those functioning in wheel chairs. As indicated by the enthusiastic response of the children, the play area can be termed a success. However, no formal study of the children's play or the contribution of the experience to the development of the children has been reported.

The Magruder Environmetal Therapy Complex of the Forrest Park School of Orlando, Florida, designed by Dr. Leland Shaw, of the Dept. of Architecture of the University of Florida, is an adaptive playground for physically disabled children with perceptual deficits. The outdoor play center, which was constructed in 1968, includes balance beams, free standing walls, foam pit, slides, overhead pull-up, and ramps of various pitches, has been termed successful since its inception by the Complex Director, Mr. James Beech. Unfortunately, no controlled research has been conducted regarding the effectiveness of the play experiences of the children in the complex.

Dr. Leland Shaw[1] is currently involved in a three-year research project funded by the National Institute of Health in which he has designed and constructed a prototype model playground for preschool handicapped children. He has constructed with wood a series of triangular-shaped modules which have surfaces of various colors and

1. This description is based on three visits to the University of Florida Project and personal communication with Leland Shaw.

texture. The circular arrangement of the interconnected modules allows children to select a variety of movements such as crawling, climbing, sliding, jumping or rolling in moving safely over and through the play apparatus. The economical cost of materials and construction of the Shaw design, its durability and popularity with the children during the first year of study alone, make this a very exciting project. The, yet to be completed, experiential research phase of the study is concerned with the effect of the playground on the perceptual-motor development, the ability of children to relate to their environment, and social development of mentally and emotionally handicapped and non-handicapped preschool children.

CONSTRUCTION OF PLAY LEARNING CENTERS

Among those factors considered in the selection of materials for the construction of the three play learning centers were durability, constructibility, weight, visual appearance, and cost. In relationship to each of the above factors the following materials were selected.

Framing Materials

The low cost of wood and the ease with which it can be utilized for construction made it a choice for the construction of the play learning centers. The two basic forms of wood utilized in this project were timber (2 to 4 inches thick and 8 to 14 feet long) and 3/4 inch plywood.

The need for periodic maintenance and its susceptibility to decay and termites were among the possible disadvantages considered before choosing wood as the basic construction medium. Wood is quite durable and readily available. Exclusive use of pressure treated outdoor pine quality lumber filled a variety of budgetary, structural and aesthetic requirements of the project.

To neutralize the effect of decay and insects, all lumber used on the project was pressure treated. Additionally, non-toxic chemical preservatives were applied to the wood to retard insect deterioration as well as reduce shrinkage, swelling, and splintering. All surfaces were brushed with a copper naphthenate solution before fastening. There is a noticeable odor on application, but the quick-dry characteristics facilitate construction time. Copper naphthenate leaves a green tinge on wood surfaces that enhances the natural grain appearance of the wood. Upon drying, the surface

can be painted over. Options available for finishing wood would be to paint, stain, or oil the exposed areas.

Surface Coverings

Various other materials enjoy special usage at the three play centers. Outdoor carpeting, used on two designs, is woven of proprietary synthetics which are highly durable and resistant to fading, soil, stain, rot, mildew, and insects. It offers good traction and adds visual attractiveness to the apparatus.

A major disadvantage of outdoor carpeting is that it requires more general cleaning than other surface materials. Leaves and conifer-type needles are more difficult to remove from carpet than from a smooth surface. Stains on the carpet become conspicuous demanding prompt treatment. Periodic cleaning with a shampoo is advisable.

A ready made tube slide is found on two of the play sites. The use of industrial fiberglass piping $\frac{1}{4}$ inch thick and 24 inches in diameter replaces heavy and awkward 55 gallon drums that might be welded together to make a slide of this type. The fiberglass is strong, termite proof, and rot free. The clear resin finish allows the tunnel-like tube a built-in light source.

Another rather inexpensive material that is easy to work with is high density polyethylene used as a sliding surface on all three play center designs. The opaque-colored plastic is light in weight, comes in various thicknesses, and has a very low coefficient of friction making it an ideal surface on which to move and slide.

Materials for Fastening

BOLTS: The most rigid joints on all the play center designs are held together by bolts; in a few instances lag bolts or lag screws were used. Where strength is particularly important, these heavy duty fasteners are recommended.

Machine bolts of $\frac{1}{2}$ inch diameter are primarily used on all play center apparatus. Bolts are approximately 1 inch longer than the thickness of the combined pieces of wood to accommodate flat washers, lock washers, and nuts. Holes for bolts were predrilled using a drill of the same diameter as the shaft of the bolts. Washers are used under heads and nuts on machine bolts only. In the few instances where carriage bolts were used, washers were not needed under the heads as carriage bolt heads bite into the wood and keep the bolt from turning as the nuts are tightened.

SCREWS: Screws are generously used on two play designs, and in part on a third. Plywood surfaces are pre-drilled and fastened to under-runner or sidewall framing supports with mostly # 12, $1\frac{1}{4}$ inch flat head self-tapping wood screws. Round head self-tapping wood screws are used to secure polyethylene material to playwood under surfaces. In these applications, # 10, 3/4 inch pan head screws were used.

NAILS: A small variety of nails were used to join wooden decking and some sub-flooring to joists and undersupports. Hot-dipped galvanized 8d, 10d, and 16d common nails were the quickest and least expensive way to fasten wood to wood.

RECOMMENDED TOOLS FOR CONSTRUCTION OF PLAY LEARNING CENTERS

The tools seen in the picture below were used in varying degrees for constructing the three play learning centers.

Additionally, the following tools were also utilized in the construction phase of the research and demonstration project:

- 4 extension cords, # 12 50' length
- 2 ground adapters
- 1 chalk line, 50'
- 4 paint brushes, 4"
- gloves
- 2 screwdrivers, 4" and 6"
- levels, 28" and 48"
- 1 wood chisel, 1"
- 2 adjustable pliers
- 1 jack plane
- 1 hacksaw
- 1 belt sander, 4" x 21"

UNITED METHODIST PRESCHOOL CENTER

The United Methodist preschool play learning center, for preschool mentally retarded children, was built at the Wolff Settlement Center located in the heart of Ybor City, near downtown Tampa, Florida. Wolff Center was once the focus of attention for the Spanish speaking community in the heart of Tampa's flourishing cigar industry. Since that time, demographic changes have taken place in the area and Wolff Center no longer enjoys the prominent position it originally held.

Wolff Center was selected as a play learning site for very practical considerations of available space, enthusiastic cooperation from teachers, and avid interest of the program's director. The preschool program, which is directed by the United Methodist Centers of Tampa, is designed to provide developmental activities in the areas of life skills, vocabulary development, academic readiness, and perceptual motor development.

A treeless, grassy 200'x200' field, immediately adjacent to the building, was used as a site for building the play apparatus. The seldom-used open field provided adequate room for construction of the table top design.

The Wolff play learning center served two groups of children as part of our project. The six boys and six girls in Group I ranged in age from 3 years to 10 years, 10 months. The mean age was 5 years, 5½ months. Of the twelve children, seven had psychological evaluations prior to enrolling in the program within the past year. Intelligence quotients ranged from 26 to 52 with a mean of 39. Official information indicated that seven children

specifically had speech and coordination problems. Retarded developmental milestones of speech, motor development, and/or intellectual development was noted in all the children.

Group II consisted of 12 girls and eight boys ranging in age from 2 years, 11 months to 7 years, with a mean age of 4 years, 10 months. Before entering the program seventeen children had psychological profiles within the last year. Intelligence quotients ranged from 45 to 96, with a mean I.Q. of 69. Speech and coordination problems were noted in ten children while retarded developmental milestones of speech, motor development, and/or intellectual development was recorded on official information profiles for all the children.

The Design Process

Many nours of planning, over a ten-week period, yielded the final table top design that was built for the children attending the United Methodist preschool program. The project staff observed the children in their classroom setting on several occasions in an effort to appreciate the size of the children and any special physical needs, to examine the curriculum followed by the teachers, and to discuss with the personnel academic, social, or emotional goals and objectives designed for the children.

Investigations of relevant literature, research, and existing playgrounds for handicapped children were then made, while at the same time, sketches, renderings, and ideas were exchanged between the project team members. Brainstorming sessions were conducted in which ideas were presented with disregard for their practicality, cost, or feasibility. Balsa wood non-scale models were made first to get a three-dimensional view of an idea and final scale models

were made of ideas that were appropriate for the needs of the population served at the United Methodist preschool program. Considerations of the cost of materials, availability of supplies, and ease of construction were final determinants before the table top design was selected for construction.

Construction of United Methodist Preschool Play Learning Center

The design of the United Methodist Preschool Play Learning Center consists of inter-connected, multi-level, brightly-colored, carpeted table tops. The play area is designed to challenge the imagination and abilities of preschool handicapped children, but will hopefully also be appealing to non-handicapped children of various ages as well. It provides for many under-over, up-and-down, around-and-through activities so children can pretend the environment is anything they want it to be.

Illustration 1.

The basic structure is approximately 340 square feet, thus the apparatus is comfortably fitted into a 30' x 20' land area. Dimensional outdoor grade, pressure treated and wood preserved pine lumber is used throughout. Four 4' x 4' wood timbers support each table top. Table tops range in height from one foot to four-and-a-half feet. The framing is accomplished by 2' x 4' wood secured to the uprights with ½ by 6 inch hex head bolts. The larger table surfaces consist of 4' x 8' sheets of AC grade 3/4 inch plywood; the smaller table tops are 4' x 4' sheets. The plywood is drilled and wood screwed to the frame, A side up, with # 14, 1½ inch flathead self-tapping wood screws. Outdoor carpet adhesive is applied to the plywood and then covered with all-weather carpeting in different colors and textures. The carpeting is wrapped around the edges of the plywood, trimmed, and affixed with an electric staple gun.

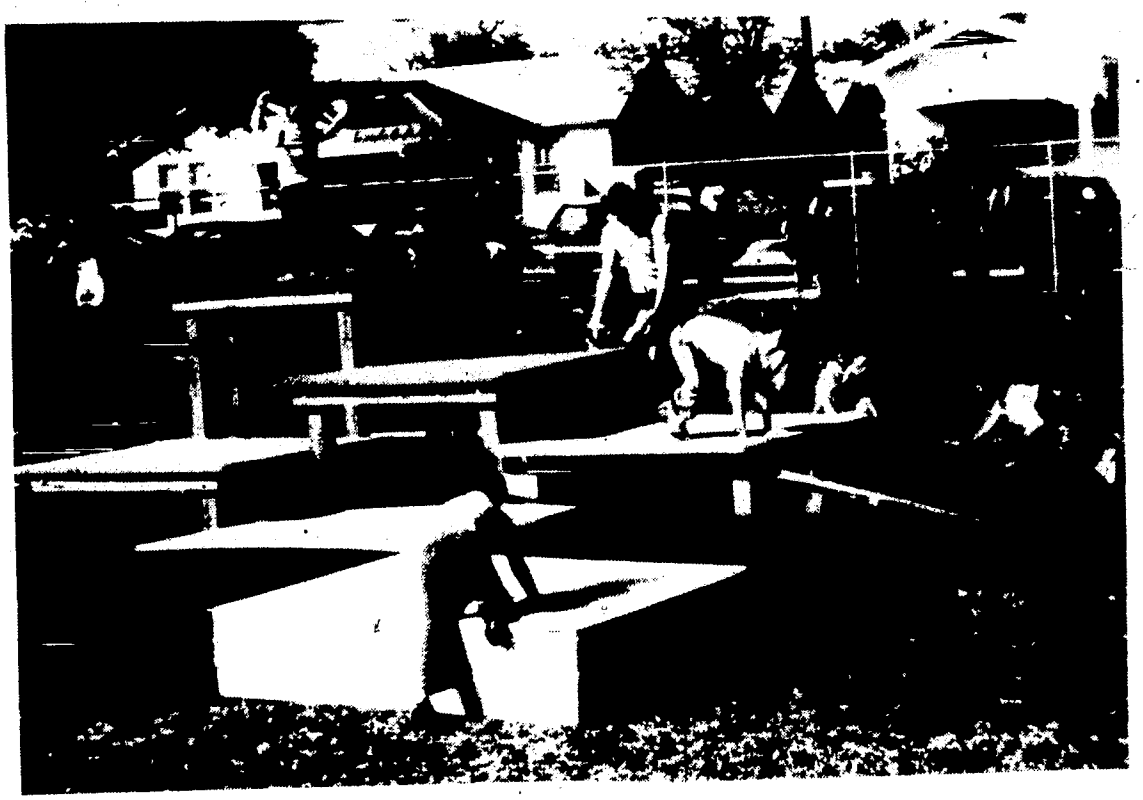

Illustration 2.

A unique feature of the play center is a see-through 4' x 8' one-half inch thick plexiglass sliding surface incorporated in the design on one end of the play area. Another smaller solid colored plexiglass sliding surface provides a natural slope to slide down or walk up, and a shade area underneath. Movable vinyl covered 12 inch polyurethane foam jumping areas also add to the variety of activities and challenges provided by the rearrangeable table-top design play center.

Cost of Construction

The cost of the materials used in the construction of the United Methodist Play Learning Center prototype model as detailed in Figure 1, totaled $1,315.28. This cost reflects prices as of January 1, 1975, in Tampa, Florida and may vary in different areas of the United States.

An analysis of the materials budget shows that the wood material, the hardware fasteners, and wood preservative, which formed the basic structure of the play apparatus, cost only $273.07 or twenty-one percent of the total cost. The material for the clear plexiglass slide and the blue laminated plexiglass slide together cost $277.00, which constitutes seventeen percent of the total cost. Thirty-eight percent of the cost of materials is represented by the $500 cost of the outdoor carpet and its installation. It is possible to self-install the carpet on the table tops at a savings of $150. Thus, if a less expensive surface covering were used, the total expense would be substantially reduced. The two 12" thick vinyl covered foam mats were fabricated at a cost of $314.21, which is twenty-four percent of the total cost. Based on the observations of use of these

mats by children, it is recommended that the thickness of the mat be reduced to 6". This would reduce their cost by approximately $160.

The materials used in the construction of the prototype model play learning center at the United Methodist Preschool Center were purchased at retail cost. It is possible that the same materials could be secured at a reduced wholesale rate or used materials contributed free of charge to a special play learning center for the handicapped project.

The play learning center was designed for simplicity of construction so that it could be easily replicated by volunteer members of service clubs, parent groups, or teachers. The success experienced in construction by the project staff, who had limited experience in building with wood, leads to a conclusion that this design can be built with relative ease by non-professional builders. Ninety-two man hours of work was needed to construct the United Methodist Preschool Center. It is estimated that a carpenter and an apprentice helper could build the center in ten working days. At current union wages in Tampa, Florida, the labor cost for construction would be approximately $1,000. Therefore, it becomes apparent that involvement of individuals in the construction process is not only worthwhile for engendering community spirit for the play center, but it will also result in a substantial savings (nearly fifty percent) in the total cost of construction.

A detailed list of the types, quantity, and costs of all materials required for the construction of the United Methodist Preschool Center is presented on the following pages and detailed construction plans are provided in Appendix E.

RECOMMENDED MATERIALS FOR CONSTRUCTION OF UNITED METHODIST PRESCHOOL CENTER

ITEM	QUANTITY			
Wood				
	9	3/4"x4'x8' plywood sheets 288 sq. ft. @ $.34.....	$97.92	
	17	4"x4"x8' 136 linear ft. @ $.34.....	46.24	
	45	2"x4"x8' 360 linear ft. @ $.14.....	50.40	
	3	2"x8'x8' 24 linear ft. @ $.26.....	6.24	
		Sub-total	$200.80	$200.80
Hardware				
	28	½"x4" Hex bolts @ $.12.....	$ 3.36	
	90	½"x5½" Hex bolts @ $.28.....	25.20	
	10	½"x6" Hex bolts @ $.37.....	3.70	
	256	½" flat washers.....	3.00	
	128	½" lock washers @ $.01.....	1.28	
	128	½" Hex nuts @ $.08.....	10.24	
	16	¼"x4" carriage bolts @ $.09.	1.44	
	16	¼" flat washers @ $.10.....	.10	
	16	¼" lock washers @ $.10.....	.10	
	16	Hex nuts @ $.02.....	.32	
	8	¼"x4" lag bolts @ $.13 hexhead	1.04	
	300	#14 1½" flathead woodscrews @ $2.21/100.....	6.63	
	3	½"x4" lag bolts @ $.18.....	.54	
		Sub-total	$ 56.95	$ 56.95
Wood Preservative				
	4	gallons Coppo @ $4.08	$ 16.32	$ 16.32

Materials List (United Methodist)

Carpet and Installation			$ 500.00	$ 500.00
Foam				
	1	48"x48"x12".....	$ 24.96	
	2	48"x110"x12" @ $57.20..	114.40	
		Sub-total	$ 139.36	$ 139.36
Vinyl Covers				
	1	48"x48"x12".....	$ 174.85	
	1	48"x110"x12".....		
		Sub-total	$ 174.85	$ 174.85
Plexiglass				
	1	Clear, $\frac{1}{2}$"x48"x96" 422 sq. ft.....	$ 135.04	
	2	Blue, $\frac{1}{4}$"x48"x48" laminated.....	$ 91.96	
		Sub-total	$ 227.00	$ 277.00
			GRAND TOTAL	$ 1,315.28

Video Recording and Analysis

A large quantity of varied movements occur during a one-half hour period on the play learning center. It is quite difficult to identify and quantify movements involved in the varied play patterns of children without utilizing a permanent recording instrument. To meet the challenges of recording the activity of children on the play apparatus in this project, video tape recording equipment was incorporated into the data gathering process. Video tape recordings provided an effective method of assuring a reliable replay of the activity occurring during the one-half hour of unstructured play experiences of the children on the play centers.

The equipment used in the study consisted of a $\frac{1}{2}$" color video tape recorder, an automatic-manual exposure color video camera with a wide angle zoom lens and built-in condenser microphone that could be hand held or tripod-mounted, and a 19" color monitor. All the equipment can be set up and operated by one person. Special features of the video recording unit include limited stop action and slow motion capabilities, fast forward and rewind for quick replays, video editing and audio editing, and capability of one hour continuous recording and playback time on one roll of tape.

The equipment is easy to thread and operate. After connecting the camera and receiver to the video recording unit there are usually two or three simple switches that activate the entire system. Minor sound and picture adjustments were called for after operation begins, but they resembled those adjustments made on most home television receivers - brightness, contrast, focus, and volume.

Before each play period started, the recorder and tripod-mounted camera, set in automatic mode, were readied near the play apparatus. At the Tampa United Methodist Center, the camera was positioned at eye level, angularly to the play equipment at a distance of 75 feet. As the children entered the play area, the recorder was activated to obtain a 30-minute recorded segment.

Videotaping occurred on two days at the Tampa United Methodist Play Learning Center. Each of two groups of children (Groups I and II) was recorded for two one-half hour periods.

All videotapes were analyzed utilizing an original technique developed by the project staff. A standardized procedure for sampling and recording movement behaviors was maintained throughout the analysis of the videotaped information to insure uniformity.

For each half hour tape, samples were taken at 1½ minute intervals. In order to accurately recognize the definitive movement occurring precisely at the 1½ minute interval, the tape was viewed seven seconds before and after the sample point. Clearly identifiable behaviors agreed upon by at least two analyzers as the tapes were viewed, were charted on a top view schematic plan of the United Methodist Preschool Play Center. Each sample was charted on a separate schematic plan sheet. Behaviors charted for each sample were transferred to composite score sheets that reflected one-half hour of movement behaviors for all children on the play learning center equipment. The composite sheets were then used as a basis for calculating the frequency and percentage of each movement occurring during each recorded play period.

Video Recording and Analysis

At the Cerebral Palsy Center, the camera was set 25 feet from the play area utilizing the wide angle feature of the zoom lens. The camera was placed angularly to the equipment at a height of nine feet to facilitate the recording of information. As the children entered the play area, the recorder was activated to obtain a 30-minute recorded segment.

Video taping occurred on 7 different days for Group I over a 17 day period. Group II was videotaped on 10 different days over a 21 day period of time.

For each half-hour tape, samples were taken at $1\frac{1}{2}$ minute intervals. In order to accurately recognize the definitive movement occurring precisely at the $1\frac{1}{2}$ minute interval, the tape was viewed seven seconds before and after the sample point. Clearly identifiable behaviors agreed upon by at least two analyzers as the tapes were viewed, were charted on a top view schematic plan of the Cerebral Palsy Play Center. Each sample was charted for each child on a separate schematic plan sheet. Behaviors charted for each sample were transferred to composite score sheets that reflected one-half hour of movement behaviors for each child on the play center equipment. The composite sheets were then used as a basis for calculating the frequency and percentage of each movement occurring during each recorded play period.

Description of Play Behavior on Play Learning Center

A clearer understanding of the developmental status of the children in Group I of the United Methodist Preschool Play Learning Center can be obtained if one looks beyond the statistics representing the average of the group presented earlier. While it is important to recognize that the mean chronological age of the group was 5 years, 5½ months and the mean intelligence quotient of the group was 39, it is perhaps more important to know more specific characteristics of individual children in understanding their response to the play learning center. Four of the children in the group of twelve were nonambulatory and thus had to be carried to the play learning center. One child had a complete hearing loss and four were unable to communicate verbally. Overall, the group displayed rather severe problems ranging from immature motor coordination, to a lack of social and emotional maturity, to possessing no self-help skills.

Children in both groups at the center were not instructed as to the use of the play learning apparatus and were allowed to engage in spontaneous unstructured play as much as possible. The research assistant supervising the play intervened only when a child's safety was threatened or a child strayed away from the area of the play apparatus.

The earlier described technique of analyzing the video taped recordings of Group I and Group II at the United Methodist Preschool Play Learning Center employed in order to identify the percentage of time children involved in various categories of play during a thirty-minute period produced detailed results.

The analysis of two thirty-minute periods of play of the children in Group I at the United Methodist Preschool Play Learning Center on two different days produced the following important results:

1. Seventeen different categories of play behavior by the children were displayed and identified on the play learning center.

2. Children engaged in play on top, under, or near the play apparatus, an average of 96.3 percent of the time during two half-hour periods of play.

3. Straying behavior, in which children had to be verbally or physically lead back to the play apparatus, was displayed only 3.7 percent during the two thirty-minute periods of continuous play.

4. While involved in play on the play learning center 47 percent of the time children were in an upright standing position and 53 percent of the time they were playing in a prone position of either lying, sitting, or crawling.

5. Children were sitting, standing, crawling, or walking under the tables 10.5 percent of the time.

6. Children were involved in crawling on the table tops 10 percent of the time.

7. Children engaged in sliding activity for 7.7 percent of the time with 3.45 percent occurring on the 8-foot long slide and 4.25 percent on the 4-foot long slide.

8. Running by children on or near the play apparatus was exhibited 4.25 percent of the time.

9. Jumping was displayed by the children 2.4 percent of the time.

10. Climbing from one table top level to another table occurred 1.35 percent of the time; whereas supporting the entire body weight by hanging appeared only .25 percent.

11. Only minimal supervision of the children on the play learning center was necessary and no injuries occurred.

Detailed percentages of the categories of play behaviors of the children in both Groups I and II at the United Methodist Preschool Center are presented in Table I on the following page.

TABLE I

CATEGORIES OF PLAY BEHAVIOR

UNITED METHODIST PRESCHOOL CENTER

	GROUP I			GROUP II		
	1st Day Percentage	2nd Day Percentage	Average Percentage	1st Day Percentage	2nd Day Percentage	Average Percentage
Lying Down	15.8	7.4	11.6	3.8	1.32	2.56
Sitting	3.7	17.9	10.8	7.9	5.26	6.58
Sitting Under Tables	8.9	.5	4.7	1.5	8.22	4.86
Standing	12.1	20.0	16.05	12.0	13.16	12.58
Standing Under Tables	4.2	2.6	3.4	6.7	11.84	9.27
Crawling	6.3	13.7	10.0	12.9	6.91	9.91
Crawling Under Table	0	1.1	.55	.6	1.32	.96
Climbing	1.1	1.6	1.35	7.0	4.61	5.81
Hanging	0	.5	.25			
Sliding[1]	5.3	2.6	3.45	12.9	8.55	10.72
Sliding[2]	7.4	1.1	4.25	5.6	3.95	4.77
Walking on Tables	12.1	7.4	9.75	5.8	11.5	8.65
Walking Near Tables	16.8	8.9	12.85	5.0	6.35	5.62
Walking Under Tables		3.7	1.85	3.8	.99	2.39
Running	1.6	5.3	4.25	11.7	9.2	10.45
Jumping	3.2	1.6	2.4	2.6	3.39	2.94
Off Play Area	1.6	4.2	3.7	.3	3.62	1.96

[1]Sliding activity on 4'x8' transparent plexiglas slide

[2]Sliding activity on 4'x4' blue plexiglas slide

The percentages resulting from the analysis of the two thirty-minute periods of play of the children in Group II of the United Methodist Preschool Play Learning Center on two different days are presented in detail in Table I. The following are results of major importance produced by the analysis of the two one-half hour videotape recordings:

1. The same seventeen categories of play behavior as identified in Group I were displayed by the children in Group II.

2. Children engaged in play on top, under, or near the play apparatus 98.04 percent of the time.

3. Straying behavior was displayed only 1.96 percent during the two thirty-minute periods of continuous play.

4. While involved in play on the play learning center 64.5 percent of the time children were in an upright position and 35.4 percent of the time they were playing in a prone position.

5. Children were sitting, standing, crawling, or walking under the tables 17.48 percent of the time.

6. Children were involved in crawling on the table tops 9.91 percent of the time.

7. Children engaged in sliding activity 15.49 percent of the time with 10.72 percent occurring on the 8-foot long slide and 4.77 percent on the 4-foot long slide.

8. Running by children on or near the play apparatus was exhibited 10.45 percent of the time.

9. Jumping was displayed by the children 2.94 percent of the time.

10. Climbing from one table top level to the next occurred 5.81 percent of the time; whereas supporting the entire body weight by hanging did not appear.

11. Only minimal supervision of the children on the play learning center was necessary and no injuries occurred.

The mean chronological age of the twenty children in Group II was 4 years, 10 months and the mean intelligence quotient of the group was 69. Thus, although the average age of the children in Group II was approximately 6 months younger the average intelligence was 30 points higher. The children in Group II displayed a lower percentage of speech deficits and motor coordination problems with only four children displaying speech problems and five lagging in motor development. All of the children in Group II were ambulatory including a boy with spinabifida who used a walker. The intellectual and motor performance of the children in Group II was considerably higher than that of Group I.

Considering the severity and range of the motor performance of the children in Groups I and II, both the number and variety of their play responses while on the play learning center was high. More importantly, children were actively engaged in movements which were related to their individual performance ability, but each was continuously seeking new physical challenges which were within their developmental reach. The design of the play center sought to provide for this type of play behavior in the children.

There were both a number of similarities and differences between the play behaviors displayed by the children in Groups I and II at the United Methodist Preschool Center. Each group of children engaged in the same seventeen categories of play and showed little difference in straying behavior off the play apparatus. Children in Group II engaged in upright standing play 64.5 percent as compared to 47 percent by the children in

Group II. The major differences in specific play behavior which would account for this are the 11.6 percent of lying down and 10.8 percent of sitting in Group I, whereas only 2.56 and 6.58 percent of lying down and crawling occurred in Group II. This difference in advanced motor performance was especially highlighted by the 10.45 percent of running behavior exhibited by Group II as compared to 4.25 percent of the same behavior by Group I. While crawling behavior was virtually the same between the two groups, Group II engaged in climbing 5.81 percent as compared to 1.35 percent for Group I. The inability of many children in Group I to climb to the four-foot level tables perhaps explains their relatively low 3.45 percent of use of the four-foot high, eight-foot long slide as contrasted to the 10.72 percent utilization of the same slide by Group II. Both groups on the other hand, demonstrated 4.25 and 4.77 percent usage of the lower two-foot high, four-foot long slide. Seemingly the inability of some children in Group I to climb to the higher slide prevented their utilization of it.

There was surprisingly no difference between crawling and walking on tables between Groups I and II, nor was a difference between sitting under tables and crawling under tables between the two groups noted.

Informal observations on weekends of the play apparatus at the United Methodist Preschool Center indicated it was used in a variety of ways by non-handicapped children of ages ranging from preschool to teenagers. An unfortunate sequence of events prevented both the above random observations from being systematically documented on videotape as well as the play of the two

groups of handicapped children over a period of fourteen weeks. These events included theft of six tables from the play center, theft of three carpets from table tops, and lastly a smashed plexiglas slide.

The selection of the Wolff Settlement House, which leased its facilities to the United Methodist Preschool Program, as a play learning center site was deliberate. It was recognized as an inner city area in which 75 out of every 1000 homes were burglarized during the year of 1974. This placed it among the top areas of crimes per capita within the City of Tampa. It was felt that if one of the designs was to be capable of being replicated in other unprotected inner city areas, it must be given a fair test of its durability and its ability to withstand vandalism. Thus, vandalism was considered in the design constructed for the United Methodist Preschool Program; however, in retrospect it was secondary to attempting to meet the developmental needs of the children.

The thirteen tables which made up the play apparatus were bolted together, however, in order to provide for periodic rearrangement of the tables they were not cemented into the ground. The brightly colored table tops proved to be attractive not only to the children but also to a neighborhood night club owner as well. Upon returning to the play learning center on a Monday morning to begin the second week of videotaping of the play of the children, it was discovered that six of the two-foot high table tops had been removed from the center to be used as a bandstand. Through the efforts of the Wolff Center Director and social worker the six tables were returned unharmed. The tables were

reconnected and readied for use by the children. We later learned of the availability of lock nuts which might have prevented the incident.

Unknown persons then removed three of the carpets from the four-by-eight-foot table tops. These were neatly cut and removed despite the resistance of the glued down underside for the apparent use as a home carpet.

As preparation was being made for repair of the carpet on the three table tops a third and final act of vandalism struck in the form of a smashed plexiglas slide. At this point, the decision was made to move the play apparatus to a protected site for repairs and possible use by the boys at the Residential Treatment Center. Ironically, the flexibility of the design which produced some of its vulnerability to vandalism also provided for its salvation. A subsequent move of the United Methodist Preschool Program to a new site will make it possible to return the table top design play learning center back to the children for whom it was intended in the second year of the project.

Subsequent to the construction of the play learning center and its utilization by children, the following points concerning the design and construction have been realized:

1. A land area as small as 40 feet by 20 feet can accommodate the thirteen tables in the play learning center design.

2. The design can be constructed by non-professional builders at a reasonable cost.

3. It is possible to rearrange the tables so as to periodically construct a new play environment.

4. The wood, hardware, and outdoor carpet has successfully weathered the elements of insects, rain, wind, and Florida sunshine for 9 months.

5. The 12-inch thick vinyl covered mats can be reduced to 6-inch thickness and still provide adequate protection for this age children.

6. Placement of the play center in a non-shaded area would warrant use of a parachute supported from a center pole to provide a tent like covering over the play apparatus.

7. A firmer support mounting of the plexiglas slides is recommended in order to prevent cracking when rearranging tables.

Conclusions

Based on the descriptive results produced by the analysis of the four thirty-minute videotapes of the play of two groups of children at the United Methodist Preschool Program, the following conclusions can be made:

1. The play behaviors exhibited by the children on the play apparatus were consistent with those intended by the designers.

2. The play learning center was successful in maintaining the attention of the children nearly all of the time during a thirty-minute play period.

3. The play center provided by environment in which children could play safely with minimum supervision.

4. Children with a lower level of motor performance will engage in substantially less play in an upright standing position as compared to children with a higher level of motor performance.

5. The play learning center design is rearrangeable, can be placed on a small land area, and can be constructed by non-professional builders for a relatively low cost.

6. The play learning center is not vandal proof and thus, must be placed in a protected area or a community relations program must accompany the design and construction of the center.

UNITED CEREBRAL PALSY PRESCHOOL CENTER

The cerebral palsy preschool play learning center for preschool orthopedically and/or neurologically impaired children, was built at the United Cerebral Palsy Center of Tampa, located six miles south of the University of South Florida main campus and five miles north and east of downtown Tampa. The C.P. Center shares common boundaries with the Hillsborough County Guidance Center and the Easter Seal Society of Tampa, in a residential and nearby commercial neighborhood.

A comprehensive preschool program is conducted at the center involving the children in physical therapy, self-help skills, academic readiness activities, speech therapy, social welfare assistance, and perceptual motor development that includes a summer aquatics program.

The Cerebral Palsy Center was selected as a play learning site as a natural extension of an on-going relationship between the Bureau of Education for the Handicapped-supported master's degree program of preparing teachers of physical education for the handicapped at the University of South Florida and the personnel at the United Cerebral Palsy Center.

Site preparation for construction was minimized because of the natural, tree-shaded, level area next to the building selected by the project staff and C.P. Center personnel.

Two groups of children were involved in using the play learning apparatus at the Cerebral Palsy Center during the project. Group I consisted of 6 boys and 4 girls ranging in age from 1 year, 5 months, to 4 years, 11 months. The mean age was 2 years, 7½ months. Because of the young age of the children, formal

psychological evaluations were not available for most of the children.

The second group (Group II) had 12 boys and 11 girls ranging in age from 4 years, 2 months, to 6 years, 5 months, with a mean age of 5 years, 1 month. Recent clinical profiles on twenty of the children reveal intelligence quotients ranging from an estimated 30 to 120 with a mean I.Q. of 80.

The Design Process

As in all of the play learning center designs, care and concern for the developmental needs of the children was exercised in the planning and design phase of the Cerebral Palsy Center play apparatus. Consultations with the center's director, physical therapist, speech therapist, social worker, and educational specialist, preceded any sketches, drawings or exchange of ideas by the research team.

Subsequent meetings of the research project staff looked at such things as academic readiness skills, gross motor development, social interaction, colors, size, textures, shapes and safety as each applied to the physically handicapped children at the C.P. Center. A search of the existing research literature concerning playgrounds for handicapped children, as presented on pages 1 through 8 of this report, revealed limited information upon which to base a design of a play learning center. The variation in the educational background of members of the research team made it possible for everyone to make a significant contribution to the final balsa wood scale model.

Construction of the United Cerebral Palsy Play Learning Center

This play center was based on the concept that all children will and need to respond to a variety in play environments. The design enables preschool physically handicapped youngsters to explore the diversity of textures, colors, shapes, materials, gradual inclines and sliding surfaces.

Soft vinyl covered polyurethane foam gives new physical sensations and experiences, especially when someone else moves unexpectedly. A focus of activity seems to be a simple carpeted stairway. The urge to play on this feature sometimes causes a traffic jam. Handrails on the entire play area are made of PVC plastic irrigation pipe. Durability and impact absorbing qualities make PVC pipe a true safety rail.

Illustration 3.

Other plastic-like materials are used to increase the movement repertoires of these preschool children. Industrial fiberglass 24-inch diameter pipe as a tube slide and high-density polyethylene facilitates sliding movements on different parts of the play area.

Textured indoor-outdoor carpeted surfaces are integrated on all of the inclines and flat surfaces in an array of bright colors that add a visual dimension not found on most traditional play structures.

Illustration 4.

Simple to work with, inexpensive, and readily available, dimensioned lumber, pressure-treated, wood-preserved pine, is used exclusively in this construction. Typical dimension lumber

on this project uses 2" x 4" and 4" x 4"'s as substructure materials, and AC grade 4' x 8' plywood sheets as a base for carpeting and sidewall enclosures.

Cost of Construction

A total cost of $2,114.94 for the purchase of materials was realized in the construction of the Cerebral Palsy Play Learning Center. An analysis of the detailed materials budget shows (See Figure 2) that the combined cost of wood, hardware fasteners, and paint was $496.49. This figure constituted twenty-four percent of the total cost. The purchase and installation of outdoor carpet was $568, or twenty-seven percent of the material cost. The 10' x 10' x 12" vinyl-covered foam mats and triangular bolsters were fabricated at a cost of $522. This represents twenty-five percent of the costs of materials. Based on the weight of the children at the Cerebral Palsy Center, it is recommended that the mat thickness be reduced to 6 inches of high density foam. This change in design would result in a savings of $261 in materials.

The materials of the very necessary handrails were relatively inexpensive at a cost of $95.15 which was only four percent of the total cost.

The polyethylene material used for the surfaces of the two slides cost $80, which was four percent of the total cost. This is considerably less than the purchase price of stainless steel which is customarily used as surfaces on slides.

The fiberglass tube slide cost $300, which is a fourteen percent cost ratio.

RECOMMENDED MATERIALS FOR CONSTRUCTION OF THE CEREBRAL PALSY PLAY LEARNING CENTER

ITEM	QUANTITY			
Wood	27	3/4"x4'x8' plywood sheets 864 sq. ft. @ $.34.....	$ 293.76	
	44	2"x4"x8' 352 linear ft. @ $.14.....	49.28	
	13	2"x4"x10' 130 linear ft. @ $.14.....	18.20	
	4	2"x4"x12' 48 linear ft. @ $.14.....	6.72	
	17	4"x4"x8' 136 linear ft. @ $.34.....	46.24	
		Sub-total	$ 414.20	$ 414.20
Hardware				
	60	½"x6" Hex bolts @ $.37.....	$ 22.20	
	120	½" flat washers	1.50	
	60	½" lock washers @ $.01.....	.60	
	60	½" Hex nuts @ $.08.....	4.80	
	350	# 14 1½" flat head screws @ $.02.....	7.00	
	8	¼"x4" lag bolts hex head @ $.13.....	1.04	
	100	# 10 3/4 Pan head tapping screws @ $1.00/100.....	1.00	
	25	¼"x1" Hex head bolts @ $.01.	.25	
		Sub-total	$ 38.39	$ 38.39
Handrails				
	16	1" PVC caps @ $.40.....$	6.40	
		40 ft. 1" PVC Sched. 40 @ $.27	10.80	
	12	1" PVC socket 45° elbows @ $.52.....	6.24	
	24	1"x3/4" PVC socket tees @ $.63.....	15.12	
	4	3/4"x1" galvanized nipples @ $.13.....	.52	

Materials List (Cerebral Palsy)

Handrails (continued)

24	3/4"x4" galvanized nipples @ $.20.....	$ 4.80	
100	Faucet washers @ $.05.....	5.00	
1	pint PVC cement @ $1.87....	1.87	
24	3/4" hub phlanges @ $1.85..	44.40	
	Sub-total	$ 95.15	$ 95.15

Protective Inserts

	Hardware for installation: 1/8"x2" flat aluminum.....	$ 49.80	$ 49.80
	Carpet and Installation.....	$ 568.00	$ 568.00

Foam

4	6"x12"x36"x60" @ $13.40 ea.	$ 54.00	
2	60"x116"x12" @ $75.40 ea...	150.80	
	Sub-total	$ 204.80	$ 204.80

Vinyl Covers

4	6"x12"x36"x60" @ $33.45 ea.	$ 133.80	
2	60"x116"x12" @ $91.70 ea...	183.40	
	Sub-total	$ 317.20	$ 317.20

Polyethylene

2	1/8"x48"x96" @ $40/sheet...	$ 80.00	$ 80.00

Tube Slide

	Fiberglass - 10 ft.	$ 300.00	$ 300.00

Paint

2	gallons house paint @ $7.85	$ 15.70	
1	gallon epoxy paint, red....	12.95	
1	½ pint gray paint	1.18	
4	gallons wood preservative @ $4.08.....	16.32	
1	gallon Maxapol thinner.....	1.25	
	Sub-total	$ 47.40	$ 47.40

GRAND TOTAL $ 2,114.94

Descriptive Data of Utilization of Play Learning Center

As described earlier, there were two groups of children involved in the study at the United Cerebral Palsy Center. Children in both groups were told only that they were going outside to play and were given no further instruction in the use of the play center. The research assistant supervising the play intervened only when a child's safety was threatened or a child strayed away from the immediate area of the play apparatus.

The daily late morning and early afternoon temperatures throughout the period of the study showed little variability.

The video tape recordings of Group I at the Cerebral Palsy Preschool Play Learning Center, over a nine week period, were analyzed so as to provide a record of the average percentage of time spent by the children during each thirty minute play session. The analysis revealed the following important results.

1. Twenty-one different categories of play behavior displayed by the children were identified.

2. Children engaged in play on the play center equipment 92.8 percent of the time.

3. Straying behavior, in which children had to be verbally or physically lead back to the play apparatus, occurred 7.2 percent of the time.

4. Children were involved in play in an upright standing position 32.3 percent of the time and 67.7 percent of the time they were playing in a prone position while on the play learning center.

5. Children engaged in crawling activities 12.1 percent of the time.

6. Children engaged in sliding activity 2.14 percent of the time with .2 percent occurring on carpeted inclines, 1 percent occurring on the polyethylene surfaces and .85 percent occurring in the fiberglass tube slide.

7. Running by children on or near the play apparatus was exhibited .57 percent of the time.

8. Jumping occurred .04 percent of the time.

9. Only minimal supervision of the children on the play learning center was necessary and no injuries occurred.

10. After the introduction of playground balls, 5.7 of the play behavior involved the utilization of the balls in some way.

Detailed percentages of the categories of play behaviors of the children in Group I at the United Cerebral Palsy Play Learning Center are presented in Tables II and III on the following pages.

TABLE II
CATEGORIES OF PLAY BEHAVIOR
CEREBRAL PALSY CENTER
GROUP I

	Average Percent	1st Day Percent	2nd Day Percent	1st Through 10th Day Average %	11th-21st Day Average %
Lying Down	15.6025	15.6	18.1	14.93	13.78
Sitting	28.9825	30.6	28.1	28.83	28.40
Rolling	.67	.6	.6	1.03	.45
Scooting	2.855	2.8	2.5	2.40	3.72
Crawling	4.7675	6.1	5.6	5.77	1.60
Crawling Down	.7825	.6	1.3	.63	.60
Crawling Up	6.555	10.6	4.4	7.87	3.35
Standing, Holding On	6.3125	4.2	4.7	8.37	7.98
Standing	3.4875	2.2	5.0	3.23	3.52
Down stairs	1.42	2.2	.6	1.96	.92
Up stairs	2.6125	3.9	3.1	2.73	.72
Walking With Handrail	4.245	8.3	3.1	4.83	.75
Walking Freely	6.685	5.6	9.4	7.27	4.47
Walking Near	1.735	.6	2.5	1.67	2.17
Sliding	.2	.6	.0	.20	.0
Sliding[1]	.155	.0	.0	.20	.42
Sliding[2]	.85	1.1	1.3	.80	.20
Tube Slide	.935	1.1	.0	.37	2.27
Running	.57	.0	1.3	.63	.35
Jumping	.0425	.0	.0	.0	.17
Off Playground	7.2125	2.8	7.5	5.5	13.05

[1]Sliding activity on slide in carpeted incline area.

[2]Sliding activity on slide attached to platform.

TABLE III
CATEGORIES OF PLAY BEHAVIOR
CEREBRAL PALSY CENTER
GROUP I

Balls Introduced 11th Day	11th-21st Day Average %	1st Day Balls Introduced	2nd Day Balls Introduced
Sitting With Ball	1.15	3.9	.7
Sitting, Rolling Ball	.15	.6	.0
Sitting, Ball Bouncing	.15	.6	.0
Crawling With Ball	.56	1.1	.7
Standing With Ball	.42	1.7	.0
Ball Bouncing	.15	.6	.0
Standing, Throwing	.55	1.1	2.2
Squatting With Ball	.15	.6	.0
Squatting, Throwing	.15	.6	.0
Walking With Ball	1.72	2.2	3.6
Walking Near With Ball	.90	2.2	1.4

Hanging Balls Introduced 15th Day	15th-21st Day Average %	1st Day Hanging Balls Introduced	2nd Day Hanging Balls Introduced
Sitting With Hanging Ball	1.47	2.9	.0
Standing, Holding On With Hanging Ball	2.20	4.3	.0
Standing With Hanging Ball	1.60	1.4	1.1

The video tape recordings of Group II at the Cerebral Palsy Preschool Play Learning Center over a fifteen week period were analyzed so as to provide a record of the average percentage of time spent by the children during each thirty minute play session. The analysis revealed the following important results:

1. Thirty-two different categories of play behavior displayed by the children were identifed.
2. Children engaged in play on the play center equipment 91.7 percent of the time.
3. Straying behavior, in which children had to be verbally or physically lead back to the play apparatus, occurred 8.3 percent of the time.
4. Children were involved in play in an upright standing position 59.2 percent of the time and 40.8 percent of the time they were playing in a prone position while on the play learning center.
5. Children engaged in crawling activities 6.6 percent of the time.
6. Children engaged in sliding activity 6.17 percent of the time with .03 percent occurring on carpeted inclines, 1.25 percent occurring on the polyethylene surfaces, and 4.89 percent occurring in the fiberglass tube slide.
7. Running by children on or near the play apparatus was exhibited 1.7 percent of the time.
8. Jumping occurred .27 percent of the time.
9. Only minimal supervision of the children on the play learning center was necessary and no injuries occurred.
10. After the introduction of playground balls, 7 percent of play behavior involved the utilization of balls in some way.

Detailed percentages of the categories of play behaviors of the children in Group II at the United Cerebral Palsy Play Learning Center are presented in Tables IV,V, and VI on the following pages.

TABLE IV
CATEGORIES OF PLAY BEHAVIOR
CEREBRAL PALSY CENTER
GROUP II

	Average Percent	1st Day %	2nd Day %	1st Day through 29th Day Average %	30th Day through 40th Day Average %
Lying	7.75	.4	5.7	5.8	10.37
Sitting	20.58	17.2	13.0	20.7	20.10
Kneeling	.08	.0	.0	.13	.0
Rolling	.94	.8	.6	1.18	.57
Scooting	1.61	.0	2.5	2.05	.95
Crawling	3.63	5.9	10.2	4.92	1.7
Crawling Down	.17	.0	.3	.28	.0
Crawling Up	2.83	5.5	7.0	4.32	.6
Sitting With Blocks	.13	.0	1.3	.22	.0
Sitting-Holding On	.04	.4	.0	.07	.0
Standing-Holding On	9.5	.3	7.9	10.77	7.30
Standing	11.20	11.7	12.1	10.25	12.25
Squatting	.32	.0	.0	.18	.52
Squatting-Holding On	.03	.0	.0	.05	.0
Stairs Down	1.05	2.3	2.5	1.32	.65
Stairs Up	1.8	3.1	3.5	2.52	.73
Walking-Holding On	4.47	9.4	4.1	4.97	3.42
Walking Freely	7.25	17.2	10.8	9.23	3.98
Walking Near	1.81	1.2	3.2	2.02	1.50
Sliding	.03	.0	.3	.05	.0
Sliding[1]	.69	3.5	1.3	1.05	.15
Sliding[2]	.56	3.9	.0	.83	.15
Tube Slide	4.89	3.1	6.3	5.82	3.20
Falling	.06	.0	.0	.05	.08
Hopping	.08	.8	.0	.13	.0
Standing-Holding On & Jumping	.10	.0	.0	.17	.0
Jumping	.27	1.6	.3	.45	.0
Skipping	.1	.0	.3	.12	.08
Running	1.70	2.3	.0	2.28	.83
Forward Roll	.14	.4	.0	.23	.0
Running and Rolling	.08	.0	.0	.13	.0
Off Playground	8.26	8.6	6.7	7.82	8.63

[1]Sliding activities on slide in carpeted incline area

[2]Sliding activities on slide attached to platform

TABLE V
CATEGORIES OF PLAY BEHAVIOR
CEREBRAL PALSY CENTER
GROUP II

Balls Introduced 29th Day	Average % 29th--40th Day	1st Day Balls Introduced	2nd Day Balls Introduced
Sitting With Ball	1.575	2.5	.8
Sitting, Rolling Ball	.375	.9	.6
Standing, Holding On With Ball	.075	.3	.0
Stairs Up With Ball	.075	.3	.0
Standing With Ball	1.825	6.0	1.7
Standing, Rolling Ball	.15	.6	.0
Standing, Throwing	.275	.6	.0
Squatting With Ball	.075	.3	.0
Walking With Ball	.55	1.3	.9
Walking Near With Ball	.375	.6	.6

TABLE VI
CATEGORIES OF PLAY BEHAVIOR
CEREBRAL PALSY CENTER
GROUP II

Hanging Balls Introduced 34th Day	Average % 34th-40th Day	1st Day Hanging Balls Introduced	2nd Day Hanging Balls Introduced
Lying With Ball	.3	.0	.0
Lying With Hanging Ball	.967	.0	2.3
Lying Catching Ball	.2	.06	.0
Sitting With Hanging Ball	3.2	7.6	.5
Standing, Holding On With Hanging Ball	.1	.0	.0
Standing With Hanging Ball	11.367	20.9	13.2
Squatting With Hanging Ball	.1	.3	.0
Kicking Hanging Ball	.567	.3	1.4
Standing, Sliding, & Jumping	.167	.0	.5

Description of Play Behavior, Village Learning Space Children at Cerebral Palsy Play Learning Center

One videotape recording was made of the Village Learning Space children. The tape was analyzed to provide a record of the percentage of time spent by non-handicapped children during a thirty minute play session.. The analysis revealed the following results:

1. Thirty-three different categories of play behavior displayed by the children were identified.
2. Children engaged in play on the play center equipment 97.5 percent of the time.
3. Straying behavior, in which children had to be verbally or physically lead back to the play apparatus, occurred 2.5 percent of the time.
4. Children were involved in play in an upright standing position 92.5 percent of the time and 7.5 percent of the time they were playing in a prone position while on the play learning center.
5. Children engaged in crawling activities 3.5 percent of the time.
6. Children engaged in sliding activity 10.0 percent of the time with 1 percent occurring on top of the tube slide and 9 percent in the tube slide.
7. Running by children on or near the play apparatus was exhibited 16 percent of the time.
8. Jumping occurred 5 percent of the time.
9. Only minimal supervision of the children on the play learning center was necessary and no injuries occurred during the thirty minute period.

Detailed percentages of the categories of play behaviors of the children from the Village Learning Space are presented in Table VII on the next page.

TABLE VII
CATEGORIES OF PLAY BEHAVIOR
VILLAGE LEARNING SPACE CHILDREN
AT THE
CEREBRAL PALSY PLAY LEARNING CENTER

	Average Percent
Lying	1.0
Lying on Tube Slide	1.0
Sitting	3.5
Sitting on Tube Slide	1.5
Sitting on Wall	3.0
Sitting on Handrail	.5
Kneeling	.5
Kneeling on Wall	.5
Backward Roll	.5
Crawling Up	1.0
Crawling Up Tube Slide	1.5
Crawling on Top of Tube Slide	1.0
Balancing on Handrail	3.5
Standing	25.5
Standing on Wall	3.0
Standing Holding On	1.0
Stairs Down	1.0
Stairs Up	1.0
Walking Freely	12.0
Walking Near	1.0
Walking Backwards	.5
Tube Slide	9.0
Sliding on Top of Tube Slide	1.0
Climbing on Handrail	.5
Climbing on Pole	.5
Jumping	3.5
Jumping and Dive	.5
Jumping from Wall	.5
Jumping and Landing on Buttocks	.5
Running	16.0
Cartwheel	.5
Throwing	.5
Off Playground	2.5

The differences in the developmental status of children in Groups I and II at the Cerebral Palsy Center is important to recognize in comparing the play behavior response of the two groups to the play learning center.

The mean age of Group I was 2 years, 7 months while the mean age of Group II was 5 years, 1 month. The more than 2 years difference in the chronological age of the two groups was evident in their level of motor performance and mental ability. Five of the ten children in Group I were able to walk only with assistance only, whereas three of the twenty-three children in Group II were able to walk with assistance only. Nine of the ten children in Group I wore leg braces, whereas fourteen of the twenty children in Group II needed leg braces. In both groups however, when recommended by the physical therapist at the center, individual children were able to remove their braces while on the play learning center.

Considering the severity and range of the motor performance of the children in Groups I and II at the Cerebral Palsy Center, both the amount and variety of their play responses while on the play learning center was high. More importantly, children were actively engaged in movements which were related to their individual performance ability and were assisted by the gentle inclines and handrails to attempt new physical challenges which were within their developmental reach. The design of the play center was intended to stimulate this type of play behavior in the children.

There were many similarities and differences between the play behaviors displayed by the children in Groups I and II at the Cerebral Palsy Preschool Center. Children in Group I exhibited twenty-one different categories of play, while Group II displayed thirty-two different categories of play. There was little difference in straying behavior off the play apparatus by children in both groups. However, children in Group II engaged in upright standing play 59.2 percent as compared to 32.3 percent by the children in Group I. The major differences in specific play behavior which would account for this are the 15.6 percent of lying down and 28.98 percent of sitting in Group I, whereas only 7.75 and 20.58 percent of lying down and sitting occurred in Group II. This difference in level of motor performance is also highlighted by the 6.53 percent of total crawling behavior exhibited by Group II as compared to 12.09 percent of the same behavior by Group I. Group II engaged in utilizing the tube slide 4.89 percent as compared to .935 percent for Group I. The inability of many children in Group I to ascend to the level of the tube slide perhaps explains their relatively low use of the slide.

There was surprisingly no appreciable difference between stair activity and walking freely between Groups I and II, nor was there a difference between the two groups in walking while holding on.

When the results of the initial and only 30-minute play period of the non-handicapped children from the Village Learning Space, matched for age and sex, is compared to the initial 30-minute play period of Group II children of the Cerebral Palsy Center a number of differences stand out. Although only one new play category

emerged in the non-handicapped group, the percentage of play in the upright position was 92.5 as compared to 59.2 percent in Group II. In addition, the straying behavior of the Village Learning Space children was only 2.5 percent as contrasted to 8.3 percent for Group II of the Cerebral Palsy Center. Both running behavior, jumping, and utilization of the tube slide was substantially higher in the non-handicapped group. Surprisingly, the children from the Village Learning Space displayed a 3.5 percent of crawling behavior as compared to a 6.6 percent crawling displayed by the handicapped children. The play of the children from the Village Learning Space in the play learning center was active, vigorous, and joyful.

As a result of the experience of constructing the play learning center and analysis of its utilization by children, the following points concerning the design and construction have been realized:

1. A land area as small as 50 feet by 50 feet can accommodate the structure which constitutes the play learning center design.

2. The play learning center design can be constructed except for carpeting by non-professional builders at a reasonable cost.

3. Polyethylene plastic which possesses a low coefficient of friction is both appropriate and durable as surface for wide slides.

4. The wood, hardware, and outdoor carpet used in construction has successfully weathered the elements of insects, rain, wind, and Florida sunshine for 9 months.

5. The 12-inch thick vinyl-covered mats can be reduced to 6-inch thickness and still provide adequate protection for this age children.

6. Placement of the play center between two large trees provided excellent shade from the sun and did not hinder drying of moisture on the carpet.

7. The 30-inch diameter by 10-foot fiberglass pipe provided an excellent tube slide on the center.

8. Electrical phalange, pipe nipple, and PVC pipe can be effectively used to construct handrails.

Conclusions

Based on the descriptive results produced by the analysis of the videotapes of the play of two groups of children at the Cerebral Palsy Center of Tampa the following conclusions can be made.

1. The play behaviors displayed by the children on the play apparatus were highly related to the behaviors intended by the designers.

2. The play learning center was successful in maintaining the attention of the children most of the time during a thirty-minute play period.

3. The play center provided an area in which children could safely play with a minimum of adult supervision.

4. Younger children with a lower level of motor performance will engage in substantially less play in an upright standing position in the play learning center as compared to children with a higher level of motor performance.

5. The play learning center design can be placed on a small land area, and can be constructed except for carpeting by non-professional builders for a relatively low cost.

RESIDENTIAL TREATMENT CENTER

The Residential Treatment play learning center for pre-adolescent and adolescent emotionally disturbed youngsters, was built at the Residential Treatment Center, located four miles west of the University of South Florida main campus. The center is located in a predominantly residential section near the northern boundary of Tampa's city limits. A complete academic and psychological program is available to the live-in residents at the Residential Treatment Center.

After discussion with several local agencies the Residential Treatment Center was chosen as a play learning site. Proximity to the University, abundant building space, an eager and cooperative working staff, and time constraints that the center could work within, made the Residential Treatment Center the best choice of alternatives available to the research and demonstration project.

When the building portion of the project began, the Residential Play Learning Center served nine boys ranging in age from 10 years to 17 years. The mean age was twelve and two-thirds years old. Psychological profiles were not available for these youngsters, but the academic developmental level ranged from kindergarten work to eleventh grade tasks.

Design Process

In contrast to the other play learning center designs, the children at the Residential Treatment Center actively participated in discussions concerning play, enthusiastically drew pictures of what they wanted as a play center and devoted a number of hours to the actual construction of the tree-house-like play apparatus.

As with the other centers, conversations with the center's personnel was an important part of the process. An investigation of current literature relevant to play equipment for this age group child was made, and project staff meetings, over several months, were conducted before a final scale balsa wood model was built.

Construction of Residential Treatment Center

Secluded under a broad expanse of shade trees, the third play area is basically an elevated deck, seven feet off the ground. The large deck is supported on four 4"x4" pressure-treated uprights-posts 10' long, set in concrete. A wood preservative coating was added for extra protection. The floor joists and bracing are 2"x6" timber secured together with $\frac{1}{2}$"x4" hex bolts and connected to the 4"x4" uprights with $\frac{1}{2}$"x6" hex bolts. The under framework is 2"x4" timber with 2"x4" planking spaced 3/8" apart to form the decking. Side rails and top rails are also constructed of 2"x4" wood.

Illustration 5.

Ascent to and descent from the deck is encouraged by a variety of modes. A ringed ladder, a metal pole, and a ½" nylon rope all provide alternative ways to reach and leave the deck.

Illustration 6.

At one side of the platform is an eight foot long, four foot wide sliding surface covered with ¼ inch high-density polyethylene. Another side of the platform features a 24 inch diameter, 10 foot long fiberglass tube slide. It's a quick, enclosed route to the natural bed of leaf-covered sandy soil around the core of the deck that cushions possible falls and sliding activities.

Cost of Construction

The total cost of materials used in the construction of the Residential Treatment Play Learning Center (detailed in Figure 3) is $657.71.

The cost of the wood, hardware fasterners, and wood preservative was only $206.37, which made up thirty-one percent of the total cost. A second major expenditure was the $300.00 cost of the fiberglass tube slide, which accounted for 46% of the total cost. Lastly, the rope used in fabricating the net was purchased for $90.00 at a cost ratio of fourteen percent to the total materials cost.

RECOMMENDED MATERIALS FOR CONSTRUCTION OF THE RESIDENTIAL TREATMENT PLAY LEARNING CENTER

ITEM	QUANTITY			
Wood				
	15	4"x4"x10' @ $.32.....	$ 48.00	
	50	2"x4"x10' @ $.18.....	90.00	
	2	2"x6"x12' @ $.20.....	4.80	
	4	2"x8"x14' @ $.22.....	12.32	
		24 ft. moulding beveled strip, 1-5/8" @ $.07.....	1.68	
		Sub-total	$ 156.80	$ 156.80
Hardware				
	30	½"x4" Hex bolts @ $.18.....	$ 5.40	
	20	½"x6" Hex bolts @ $.37.....	7.40	
	20	½"x8" Hex bolts @ $.40.....	8.00	
	140	½" flat washers @ $1.50...	1.50	
	70	½" lock washers @ $.01....	.70	
	70	½" Hex nuts @ $.08.....	5.60	
	4	lbs. nails, 10d @ $.23/lb.....	.92	
	6	lbs. nails, 16d @ $.25/lb.....	1.50	
	1	box #14 1½ pan head screws @ $2.23.....	2.23	
		Sub-total	$ 33.25	$ 33.25
Polyethylene		.125"x4'x12'-High density	$ 50.00	$ 50.00
Tube Slide		10 ft.- 24" diameter ¼" wall fiberglass,@ approx. $30/ft.....	$ 300.00	$ 300.00

Materials List (Residential Treatment Center)

Wood Preservative	4	gallons Coppo @ $4.08....	$ 16.32	$ 16.32
Concrete	6	ready mix bags @ $1.89...	$ 11.34	$ 11.34
Rope		200 ft. ½" nylon rope @ $.45/ft.....	$ 90.00	$ 90.00
			GRAND TOTAL	$ 657.71

Descriptive Data

The major focus of the research and demonstration project effort at the Residential Treatment Center, was the involvement of the live-in residents in the design, planning, and construction of the tree-house-like play apparatus and, to a lesser extent, their utilization of it. Videotaping of play behaviors was not conducted due to the fact that construction of the play center was completed at the end of the research phase of the project. Thus, the process of designing and constructing, rather than the play response of the boys, was the important aspect of this center project. Once the basic supporting structure was constructed it was possible to utilize the skills of all of the boys, ranging in age from 7 to 15 years, in the construction. The tasks performed by the boys ranged from sawing, to hammering, to tightening bolts.

Informal observations and reports by the personnel at the center indicate that use of the equipment has been sustained by the boys in residence over a five month period. The various play behaviors exhibited by the boys included climbing the rope net, ladder, and fireman's pole, and sliding down the tube slide, wide slide, and firemen's pole. The climbing activity which was necessary in order to get into position for the sliding endeavor was vigorous and did provide a moderate degree of exercise for the boys.

All the materials, including the fiberglass tube slide, polyethylene sliding surface, and the nylon rope net, have withstood the natural elements of Florida's summer rainy season and use by the pre-adolescent and adolescent boys at the center.

Unsolicited candid comments by the boys revealed feelings of satisfaction and accomplishment at completing an intricate project as well as feelings of personal identification with a tangible object that really was a result of their efforts.

Conclusions

Within the limitations of the project at the Residential Treatment Center the following conclusions can be drawn:

1. It is possible to involve pre-adolescent and adolescent boys with emotional problems in the process of designing and constructing a play learning center.
2. The process of designing and constructing the play learning center did create a feeling of accomplishment on the part of the boys.
3. The play learning center did stimulate those play behaviors intended in the design.
4. All of the materials used in construction withstood the elements and utilization by the boys over a period of time.

RECOMMENDATIONS FOR FURTHER RESEARCH

Descriptive Research

Based on the review of research studies and identification of demonstration projects conducted by this research and demonstration project, it is recommended that future research needs to address itself to the following questions:

1. To what extent is current traditional equipment on school and community playgrounds being utilized by children? Is there any relationship between the type and severity of the handicapping condition and the use of the equipment? Are the developmental needs of handicapped children being met by traditional playground equipment?

2. How can existing playground apparatus be modified for accessibility and safe use by handicapped children?

3. What are the abstract preferences of children in regard to color, texture, size, and shape? Do their selections differ when color, texture, size, and shape are incorporated in the design and construction of play apparatus? Do either of the above preferences differ between handicapped and non-handicapped children?

4. How does the size, shape, and positioning of play apparatus affect the patterns of movement of children?

5. Is there a difference between the response of handicapped and non-handicapped children to play equipment specially designed to stimulate development? Do children of different ages respond to the equipment the same way over an extended period of time?

6. Would the experiences of handicapped and non-handicapped children in using the same developmental playground produce a modeling effect with regard to motor performance and social interaction?

7. How can members of the community and/or parents effectively be involved in the planning, construction, and supervision of developmental playgrounds? To what extent will community involvement or special design considerations reduce vandalism to unprotected playgrounds?

Experimental Research

1. Will significant improvement in motor development occur as a result of play experiences on a developmental playground? Will change in motor development be accompanied by change in body image and/or self-concept?

2. Does a developmental playground contribute significantly to the social attitudes and abilities of children who play on it?

3. Can cognitive learning be significantly enhanced through active learning experiences on the developmental playground?

4. Will perceptual motor development be significantly improved through play experiences on a developmental playground? Is there a relationship between the age of the children, type and severity of handicapping condition, and improvement in perceptual motor performance?

5. Is there a relationship between the age of the children, the type and severity of handicapping conditions, and improvement in each of the above variables as a result of the developmental playground experience?

6. Will simultaneous utilization of the developmental playground by handicapped and non-handicapped children produce different results regarding change in each of the above variables as opposed to isolated use by handicapped children alone?

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APPENDIX A

Information Dissemination Associated With Play Learning Research And Demonstration Project

INFORMATION DISSEMINATION ASSOCIATED WITH PLAY LEARNING RESEARCH AND DEMONSTRATION PROJECT

DATE	ACTIVITY
9-21-75	College Kaleidoscope, WTVT Channel 13, Tampa, Fla. Dr. Louis Bowers, 30 minute presentation on innovative playgrounds.
9-28-75	Independent Day School, Tampa, Florida Dr. Louis Bowers, Playground design presentation Eight members of Board of Directors present.
10-5-75	Department of Mental Retardation, State of Florida Conference, Orlando, Florida, Play Learning Centers for the Mentally Retarded, Dr. Louis Bowers, 60 Directors of Special Olympics.
10-7-75	Professional Assessment Graduate Seminar, University of South Florida, Tampa, Florida, Graduate Assistant Sandra Bird - research and demonstration project presentation, 20 master's degree graduate students.
11-13-75	Early Childhood Education classes, University of South Florida, Tampa, Florida. Dr. Louis Bowers, play learning center presentation, 60 senior year Early Childhood Education majors present.
11-14-75	United Methodist Centers Annual Meeting, Tampa, Florida, Mike Silverstein, Research and Demonstration Project presentation, 50 United Methodist Church officials present.
1-24-75	WUSF Radio - Dr. Louis Bowers talks with Dr. Wm. Taft, Director of Sponsored Research, 30 minute program.
1-27-75	University of Miami Faculty Club, Coral Gables, Fla., Florida Desegregation Center; Dr. Louis Bowers, Mike Silverstein, play learning center research and demonstration project presentation, 75 teachers, supervisors, and University faculty present.
3-10-75	Florida Mental Health Institute Children's Research and Training Program. Dr. Louis Bowers and Mike Silverstein, playground design considerations, three staff members of Children's Unit present.

Information Dissemination (continued)

DATE	ACTIVITY
3-11-75.	Civitan Day Care Center, Tampa, Florida. Dr. Louis Bowers and Mike Silverstein, playground design considerations, four staff members of McDonald Training Center present.
3-13-75	Atlantic City, N.J., National Ad Hoc Committee on Physical Education and Recreation for the Handicapped, Dr. Louis Bowers, progress report on play learning centers research and demonstration project, 50 BEH Training Project Directors and graduate students present.
3-15-75	Atlantic City, N.J. National Convention of the American Alliance of Health, Physical Education, and Recreation Elementary Physical Education Drop-In Center, Dr. Louis Bowers presentation on innovative playgrounds, 20 physical educators present.
3-20-75	WUSF Radio - Mike Silverstein playground project feature.
3-21-75	United Cerebral Palsy Center, Tampa, Florida, State Director's Meeting. Dr. Louis Bowers and Mike Silverstein, play learning center research and demonstration project report, 25 directors of cerebral palsy centers of Florida present.
5-75	District 4 Meeting of Florida Recreation and Parks Association, New Port Richey, Florida, Dr. Louis Bowers and Mike Silverstein, Research and Demonstration Project Report and Playground Design Considerations.
5-75	"Playground Alternatives"-Mike Silverstein. Three presentations in classes at the University of South Florida, Tampa. Health and Physical Education for the Child, Curriculum and Instructional Process in Physical Education, Continuing Education Early Childhood Seminar, 100 students present.
6-16-75	University of Missouri, Columbia, Missouri, visiting scholar, Dr. Louis Bowers, Research and Demonstration Project Report, 30 master's degree graduate students.
5-9-75	Bureau of Education for the Handicapped Graduate Assistants Seminar, University of South Florida, Tampa, Florida, Dr. Louis Bowers, Mike Silverstein, Sandra Bird, Ginger O'Neal, Glenn Holstman, Research and Demonstration Project Report, 15 master's degree students and faculty present.

APPENDIX B

Playground Design Checklist

PLAYGROUND DESIGN CHECKLIST

Curiosity, spontaneity, variety, creativity, discovery, mastery, and universality are characteristics of the play of young children. Play could be thought of as doing what you want to do when you want to do it, as the child does not wait for a specific or appropriate time to play, but rather initiates voluntary play activities as an important part of experiencing and discovering life. The child's play and development are a continual and integrated process. Play is the child's work, a medium for learning, and the research by which self is explored in relationship to the world.

The spontaneous and emerging nature of play and, indeed, its very definition does not result in a product which can be classified, measured, weighed, or sold. As a result of its seemingly unproductive nature many adults think of play as being unimportant and frivolous. Jean Piaget, the noted Swiss psychologist, has suggested that much of what we call play is really the active process of the child's development of intelligence. Therefore, rather than play merely providing the opportunity for the child to use up surplus energy so that he will be settled down for the more important work of academic learning it should be viewed as a vital part of the developmental and learning process which is related and gives support to academic learning. The young child does not make a differentiation between play and learning until he is told that it is time to stop play in order to start the more serious task of learning. Some sociologists feel that play on the playground reproduces the social regulations of the society in miniature and the play and interplay of the child with this environment and with

other children affects the development of social skills. To the extent the above relationship exists, we have an opportunity to create an environment for play which will nurture those traits which reflect either the lowest or highest aspirations of our society.

The needs of children for physical development include involvement in physical activity in which there is vigorous contraction of muscles in moving the body up, over, down, under, and through a variety of environmental challenges. Basic movements such as crawling, climbing, running, jumping, swinging, and sliding are engaged in by children when the environment permits and is conducive to safe play.

Because children are not always fully in control of their destiny on the playground, adults must assume the responsibility for their safety and well-being. These adults include parents, teachers, recreation leaders, and all others concerned with the positive development of children.

The checklist presented on the next few pages is designed to assist those responsible adults examine the environment in which much of the play of childhood does or could take place. The playground checklist can be used to evaluate existing home, school, and community playgrounds, or to develop new play areas for growing children.

ENVIRONMENT

Quiet play areas allow children to sometimes tune out the rest of the world. Privacy is needed for children since the playground may offer the only opportunity for some children to be alone. A "kid-sized" place, a low wall around a sand box, an enclosed tree house or fort, a simple roof to provide a shaded place, or wind break can be the nook or cranny where the child can be away from the commotion for awile. Trees and other plantings can also provide shade and privacy.

A sand and water area gives a new dimension to playgrounds. An avoidable aspect of modern living - littering by cats, dogs, and people - must be considered when planning this area.

INSTALLATION

Efficient use of space and materials in the play environment will significantly affect the amount of enjoyment children will experience. Alternatives for play can be maximized by pieces of equipment that are rearrangeable and at the same time built of durable materials that have strength and stability when put together.

MAINTENANCE

Playgrounds should not be built for the convenience of custodians, yet the question of permanency is usually paramount. Concrete-and-steel are easy to hose down, yet such materials are not necessarily easy on the soft bodies of children. Whatever equipment is available, as deterioration occurs due to weather and the normal

usage by children, equipment should be repaired, improved, or be removed from the playground.

EQUIPMENT

Needs Supervision - On-site leadership is the part of the human component of a playground. Experienced play leaders offer guidance, leadership and direction to children. They make an environment potentially more healthy and safe, in as much as children are not always the masters of their own fate in many playground situations.

Performance of Another Child - Mutual trust can be developed, however when the situation is turned into competition invisible dangers may be created in which losing may be deadly.

Does Not Cause Dizziness or Disorientation - Inertial effects of rotary motion on a piece of equipment do not necessarily add to the inventiveness and judgment making abilities of children.

Has Appropriate Step Height - Step height should be controlled to an appropriate size for the range of children expected to use them. A child should not be required to step above his knee height to reach the next highest step.

Provides Appropriate Bar Spacing - The spacing of bars on climbing apparatus should not exceed 14 inches for children under six years old. For children over six years old an acceptable space is from 14 to 18 inches apart.

Provides Appropriate Rail or Rung Size - Climbing apparatus rungs, and ladder and platform protective rails, should be

cylindrical in all cases. The diameter should permit a firm grip without allowing the encircling fingertips to touch the palm of the hand. Pipe size should be from 1" to $1\frac{1}{4}$", inside diameter.

Has No Sharp Edges or Corners - Sharp edges and corners present a constant hazard to children and should therefore be eliminated. The difference between a sharp or rounded corner can be a deep gash or a bruise.

Has Splinter-Free Surfaces - Structures which are sanded during construction often become increasingly smooth from the constant polishing by kids' contact. One answer to splinters is to let children play.

Provides Non-Slip Surfaces - Standing surfaces should be large enough for free movement. Good traction is essential and should provide sure footing without being sticky.

Has Soft Moving Parts - A "soft" environment automatically adds to safety and positive movement experiences. Where practical limitations do not allow soft parts upon which to move, safety and practical considerations do not have to be incompatible. Chances for injury can be minimized using alternative products such as vinyl-coated materials, soft plastics, and energy absorbing foams.

Is Built at Appropriate Height - It seems reasonable to expect the height from which a child falls will influence his injuries. The problem here is the preschool child usually exceeds the design limits of an eight foot piece of equipment and the danger of an injury producing fall is not

apparent until too late. Equipment does not have to be eight feet tall to be exciting and interesting.

Has Wide Sliding Surface - The low wide slide is the alternative for children which allows for many children going up and down in many different ways while not exceeding the design limits of the slide.

Has Protective Rails or Sides - Standing surfaces should have continuous protective rails within comfortable reach of both hands at each side. There should also be a secondary bar beneath the handrail to prevent slipping underneath and falling to the ground. On sliding surfaces the siderails or sides should prevent a child from toppling over the side from a seated position.

Placement Considerations - Components of an active play area should be arranged so that children doing one thing will not run into some part of the structure or interfere with children doing something else.

Has No Radical Angle for Climbing - The angle of inclination on ladders or other climbing devices should allow children to stand vertically on one level without the legs contacting the next upper level with the lower leg.

Has Protected Pinch Points - Pinch and crush points should be designed so that fingers and hands cannot get caught under normal use or abuse.

Has Adequate Openings for Crawl Spaces - Openings must be large enough so as not to inhibit the child or the usefulness of the equipment unless the nature of the crawling activity is inherently unsafe.

IMPACT SURFACES UNDER EQUIPMENT

When a child falls on a surface the energy of the impact is often dissipated by displacing or fracturing the bones. The need is for the surface to deform slowly or in other words absorb the impact. Playground surfaces can range from soils, through concrete or asphalt surfaces, to fabricated rubber or plastic foam combinations. It is essential to have a high energy absorbing material under an active play structure.

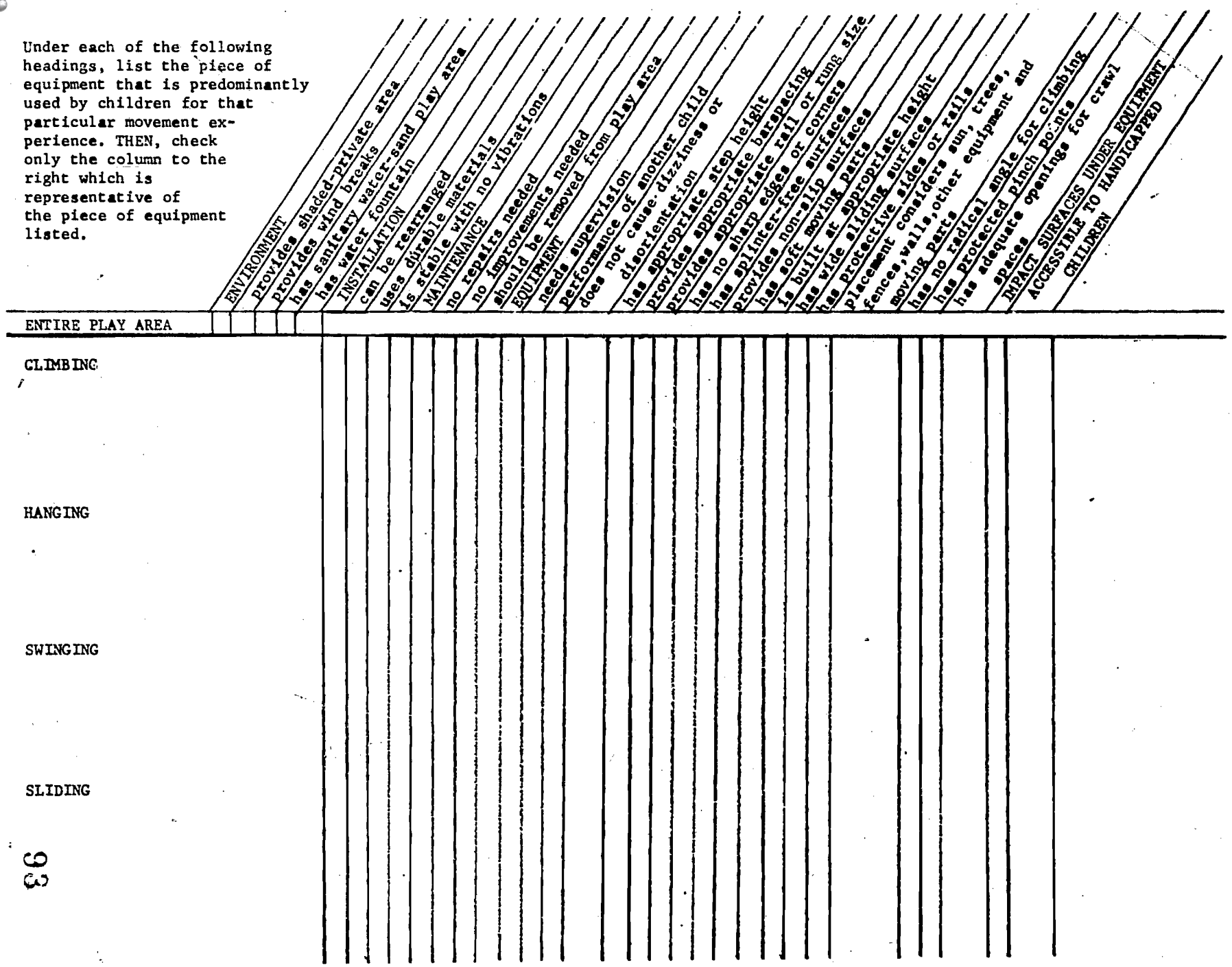
ACCESSIBLE TO HANDICAPPED CHILDREN

Simply stated, those with mental, physical, or emotional disabilities must be able to go easily to play areas and be able to use the equipment free of barriers. If handicapped children can use the equipment any child will be able to participate on the playground.

Under each of the following headings, list the piece of equipment that is predominantly used by children for that particular movement experience. THEN, check only the column to the right which is representative of the piece of equipment listed.

	INSTALLATION: can be rearranged	uses durable materials	is stable with no vibrations	MAINTENANCE: no repairs needed	no improvements needed	should be removed from play area	EQUIPMENT: needs supervision	performance of another child does not cause dizziness or disorientation	has appropriate step height	provides appropriate barspacing	has no sharp edges or corners	provides appropriate rail or rung size	has splinter-free surfaces	provides non-slip surfaces	has soft moving parts	is built at appropriate height	has wide sliding surfaces	has protective sides or rails	placement considers sun, trees, fences, walls	moving parts. other equipment and	has no radical angle for climbing	has protected pinch points	has adequate openings for crawl spaces	IMPACT SURFACES UNDER EQUIPMENT	ACCESSIBLE TO HANDICAPPED CHILDREN
JUMPING																									
BALANCING																									
ROTARY MOVEMENT																									
SAND PLAY																									
WATER PLAY																									

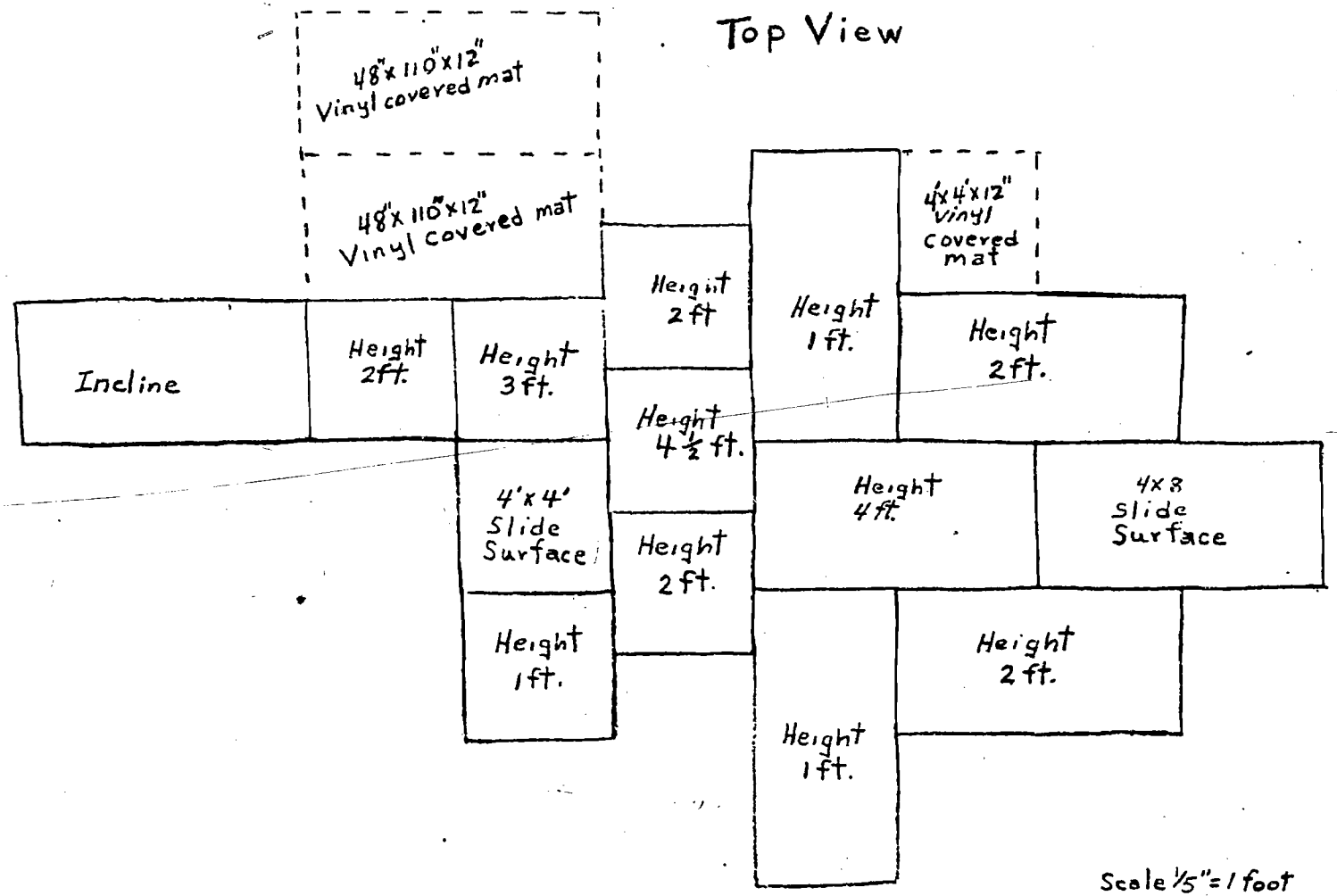
Under each of the following headings, list the piece of equipment that is predominantly used by children for that particular movement experience. THEN, check only the column to the right which is representative of the piece of equipment listed.



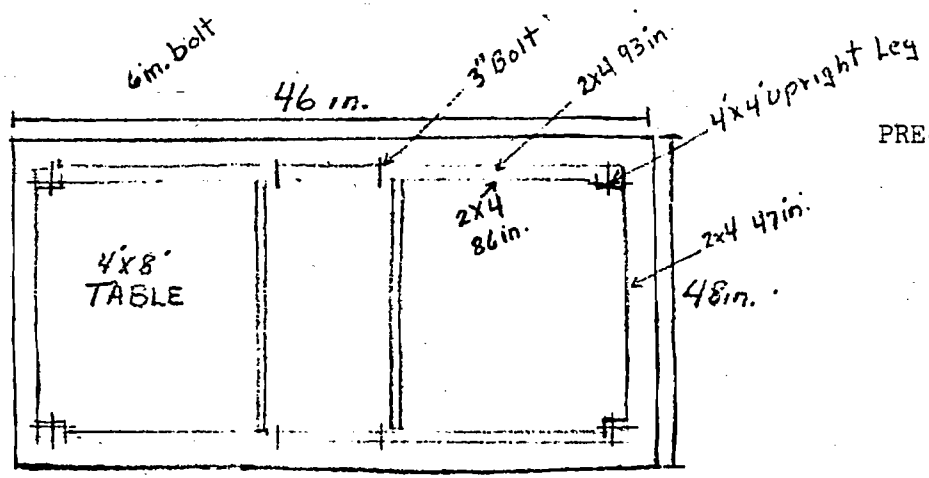
APPENDIX C

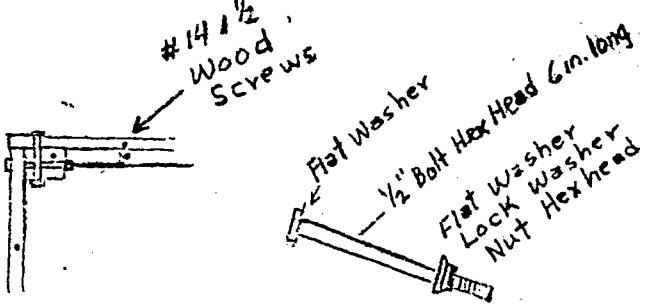
Detailed Construction Plans
For United Methodist Preschool
Play Learning Center

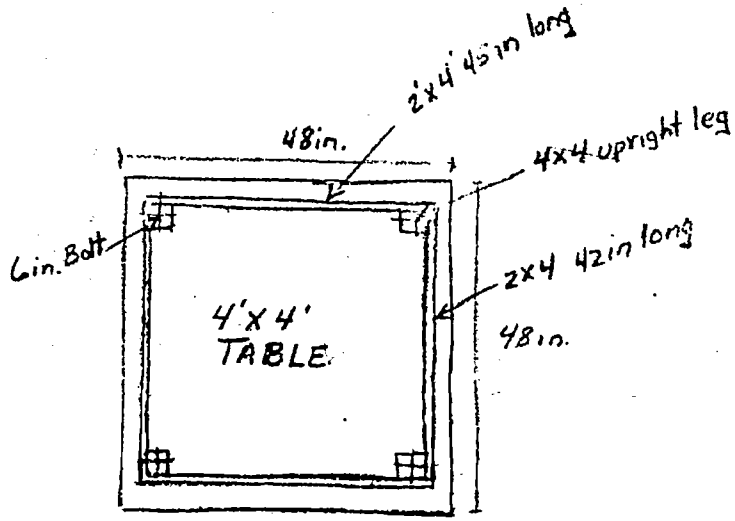
UNITED METHODIST
PRE-SCHOOL PLAY LEARNING CENTER



UNITED METHODIST
PRE-SCHOOL PLAY LEARNING CENTER
TABLE CONSTRUCTION

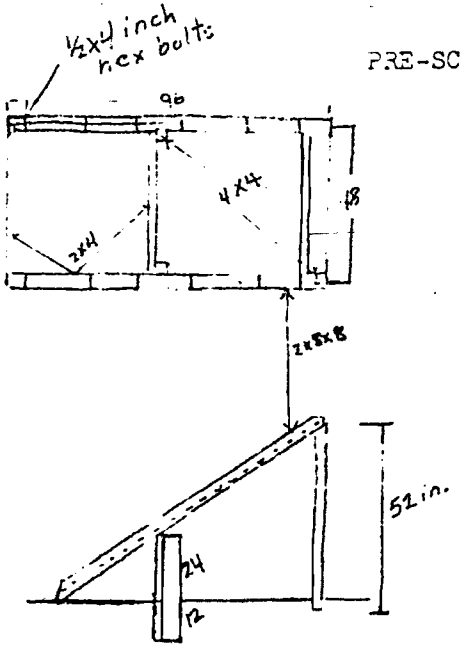


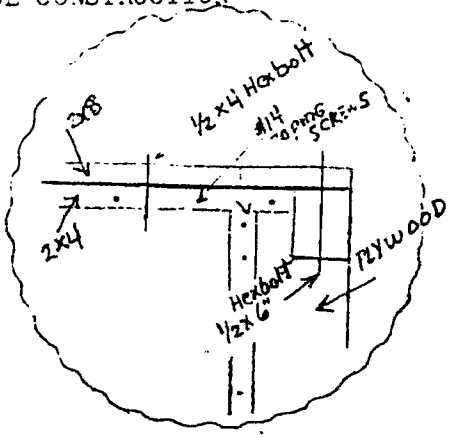


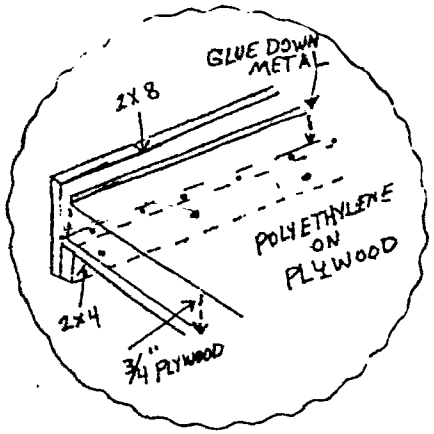


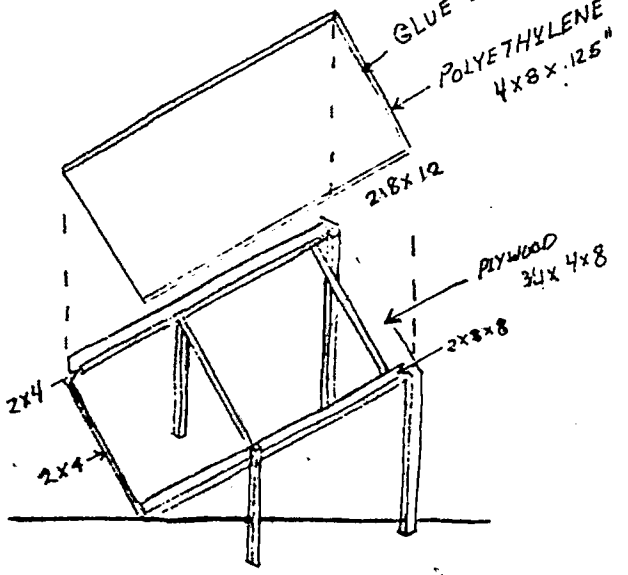
scale 3/16" = 1 foot

UNITED METHODIST
PRE-SCHOOL PLAY LEARNING CENTER
SLIDE CONSTRUCTION







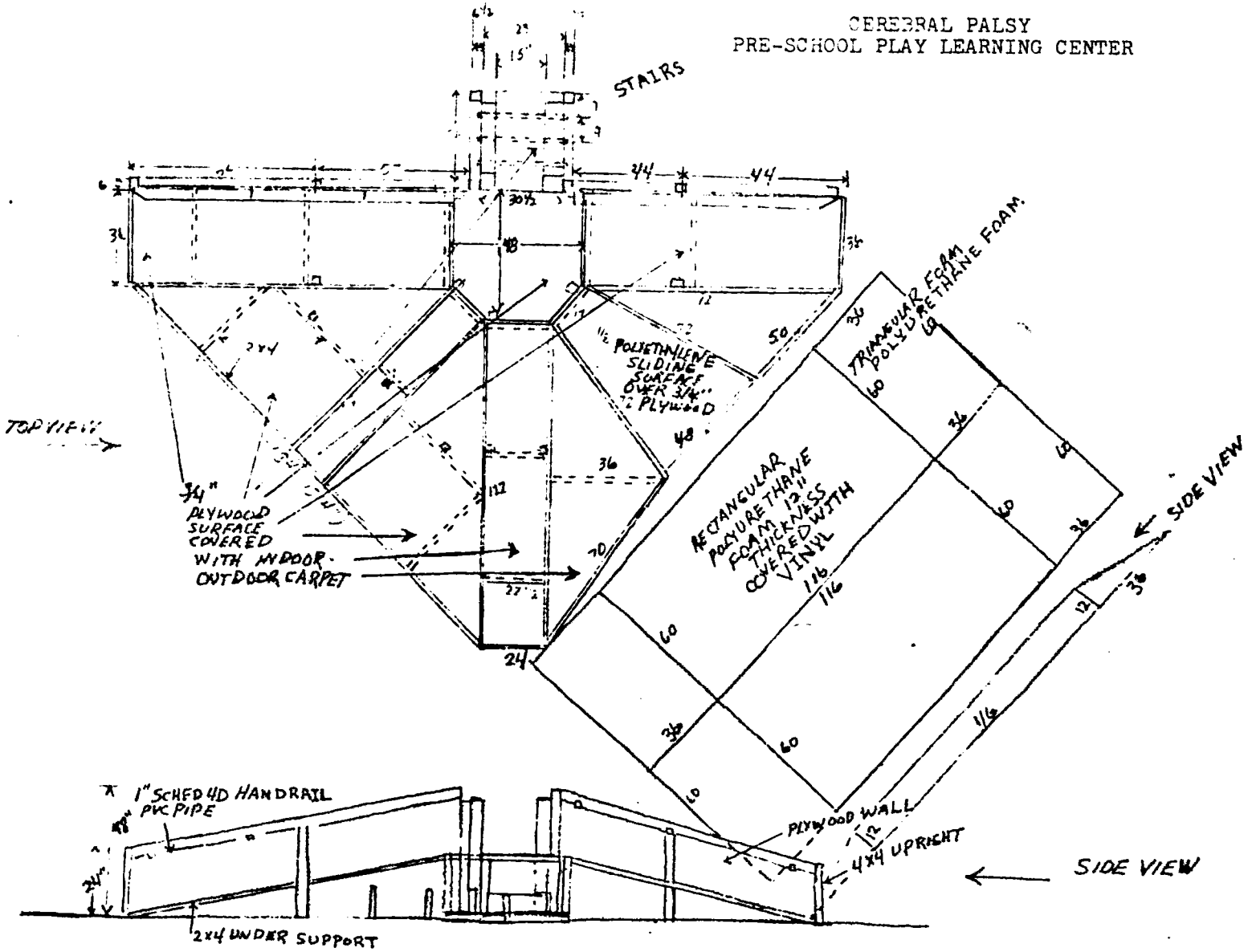


scale: 1/5" = 1 foot

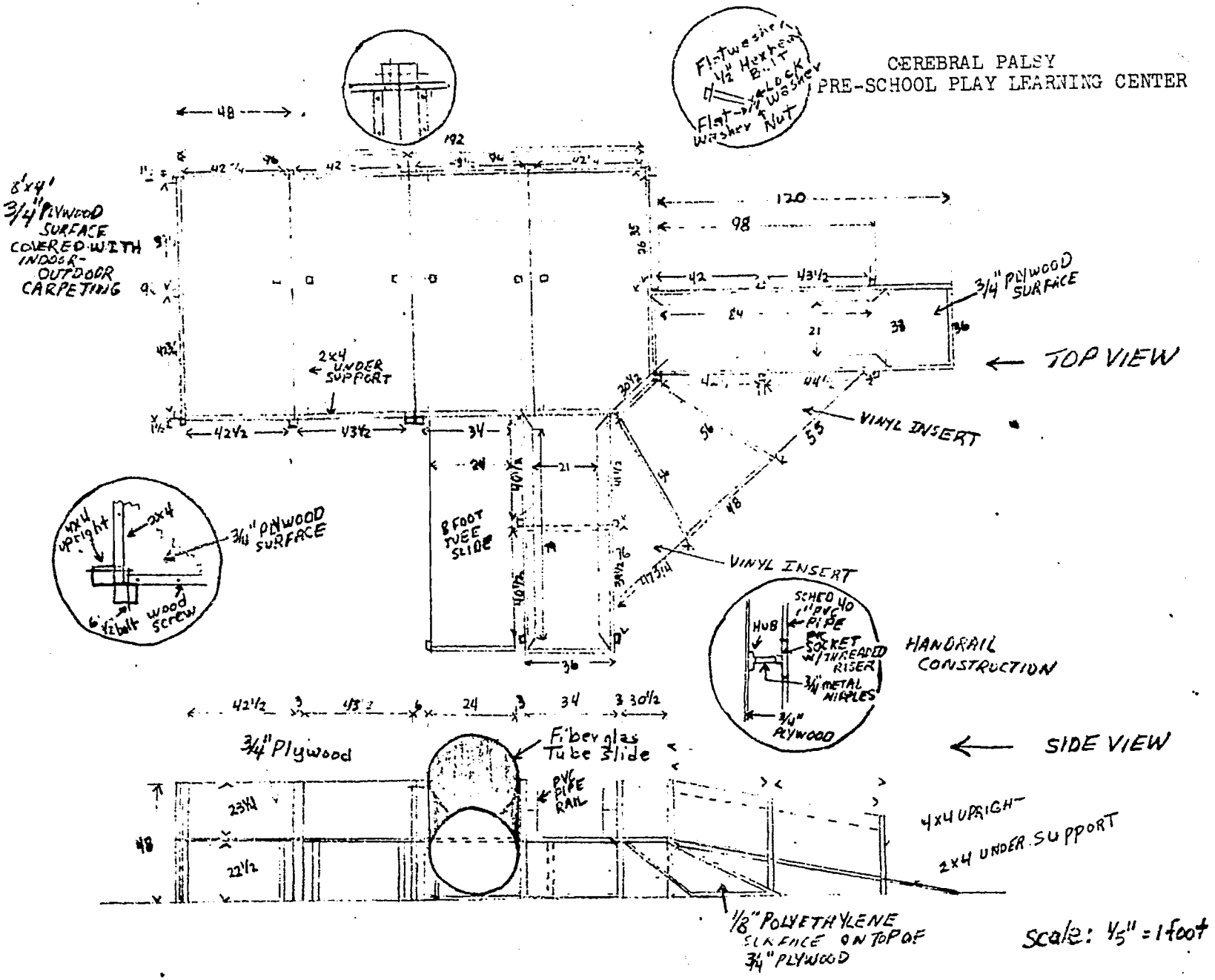
APPENDIX D

Detailed Construction Plans For Cerebral Palsy Preschool Play Learning Center

CEREBRAL PALSY
PRE-SCHOOL PLAY LEARNING CENTER



CEREBRAL PALSY
PRE-SCHOOL PLAY LEARNING CENTER



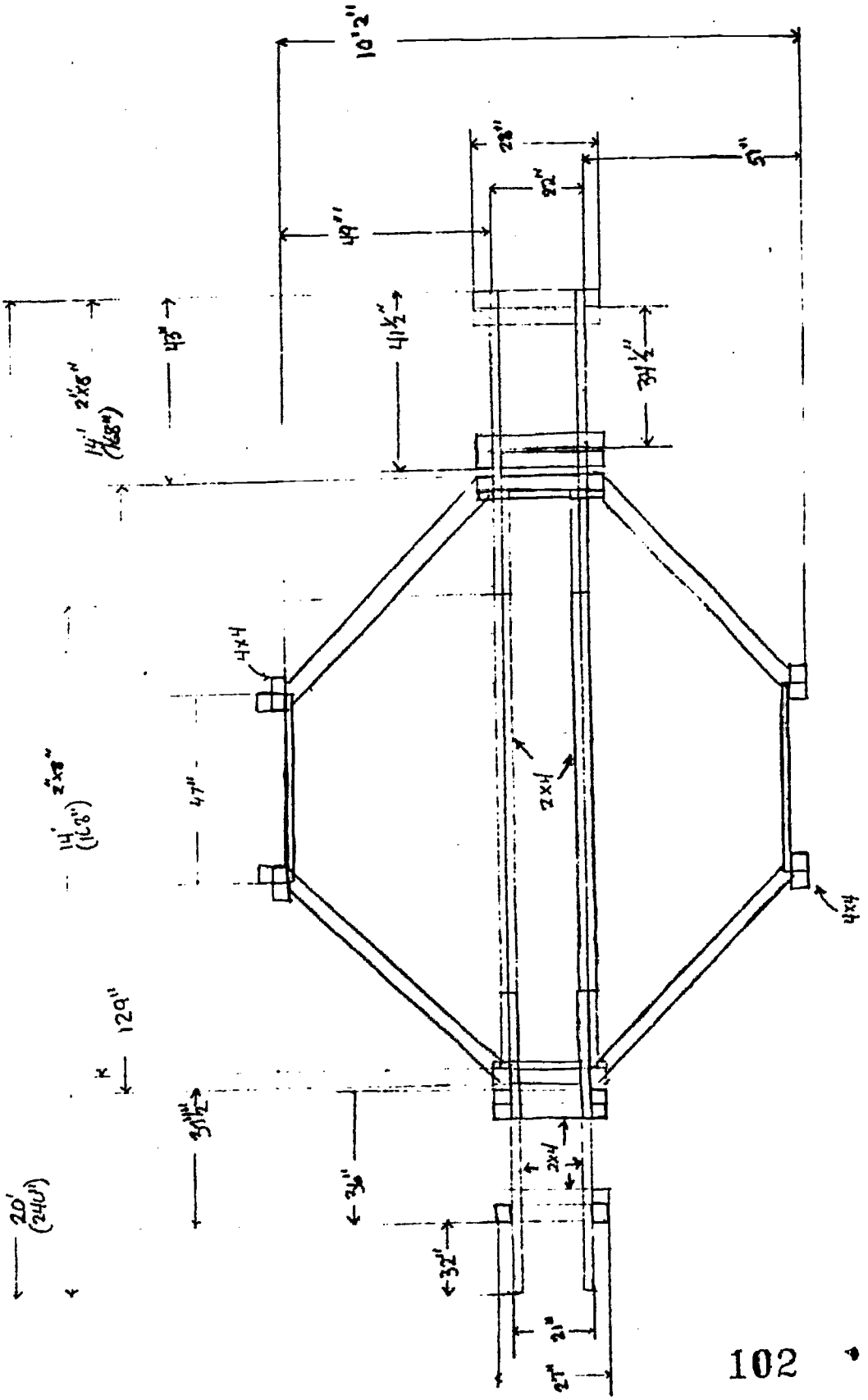
APPENDIX E

Detailed Construction Plans

For Residential Treatment

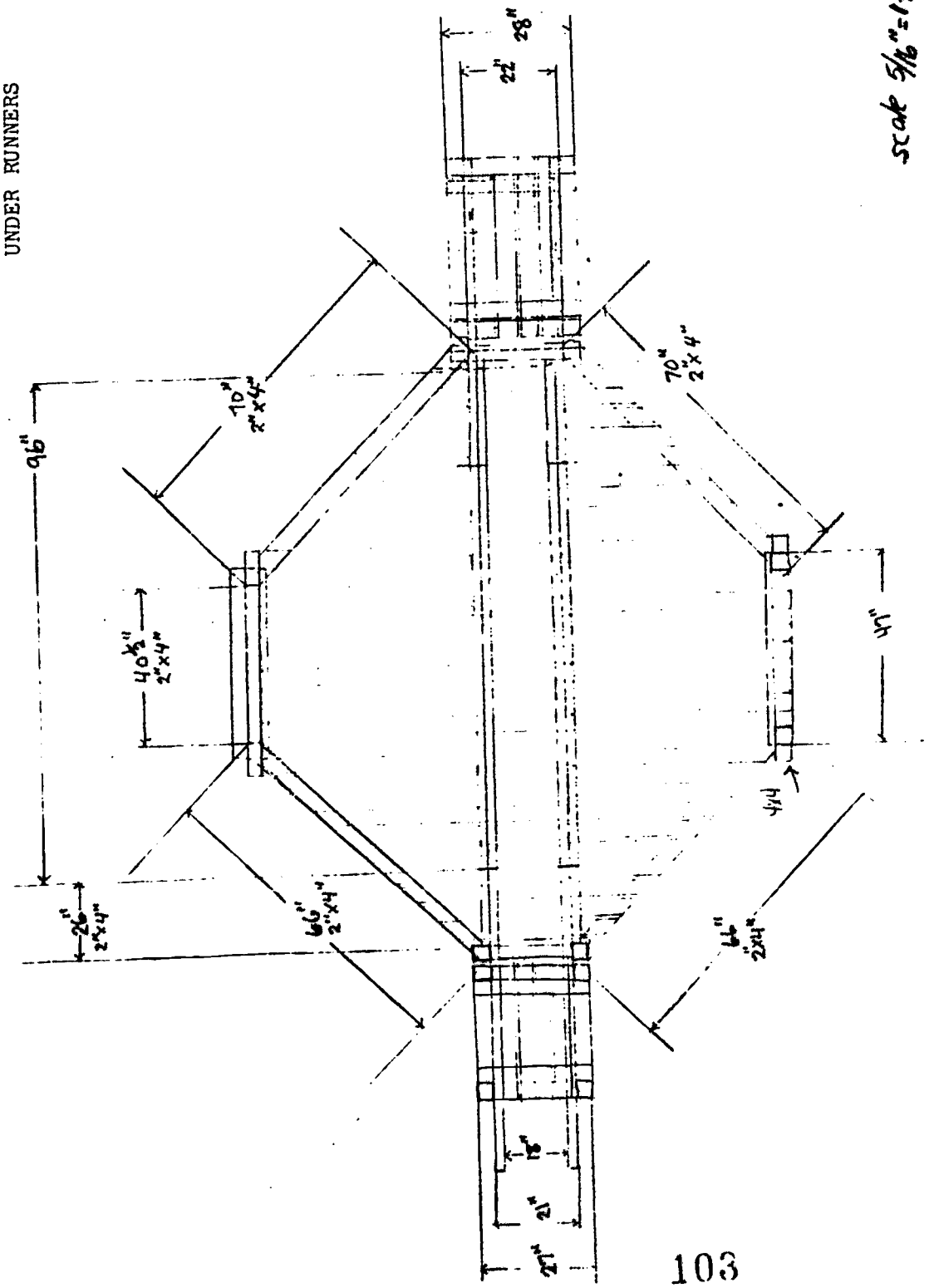
Play Center

RESIDENTIAL TREATMENT
PLAY LEARNING CENTER

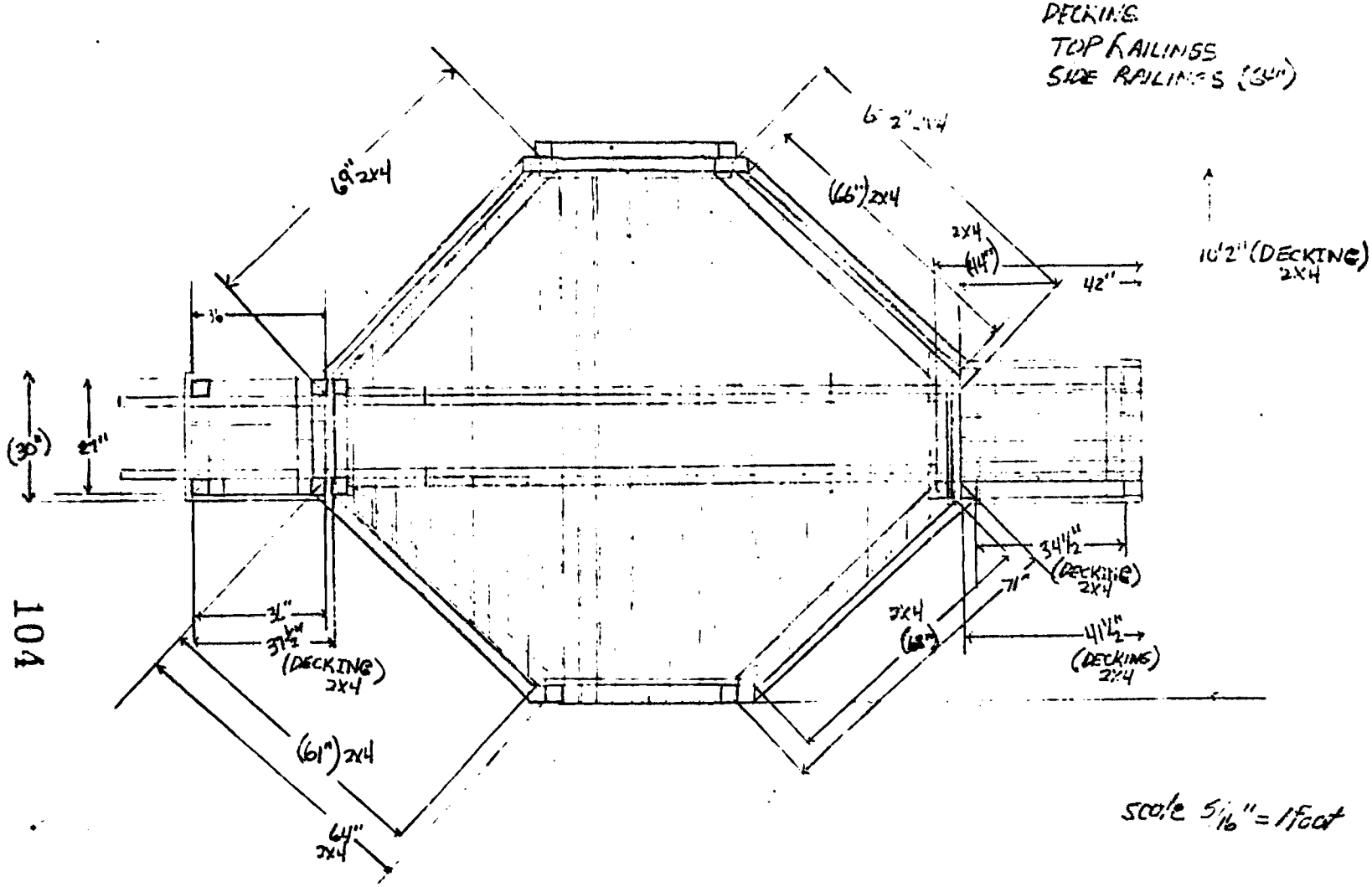


Scale 5/16" = 1 foot

RESIDENTIAL TREATMENT
PLAY LEARNING CENTER
UNDER RUNNERS

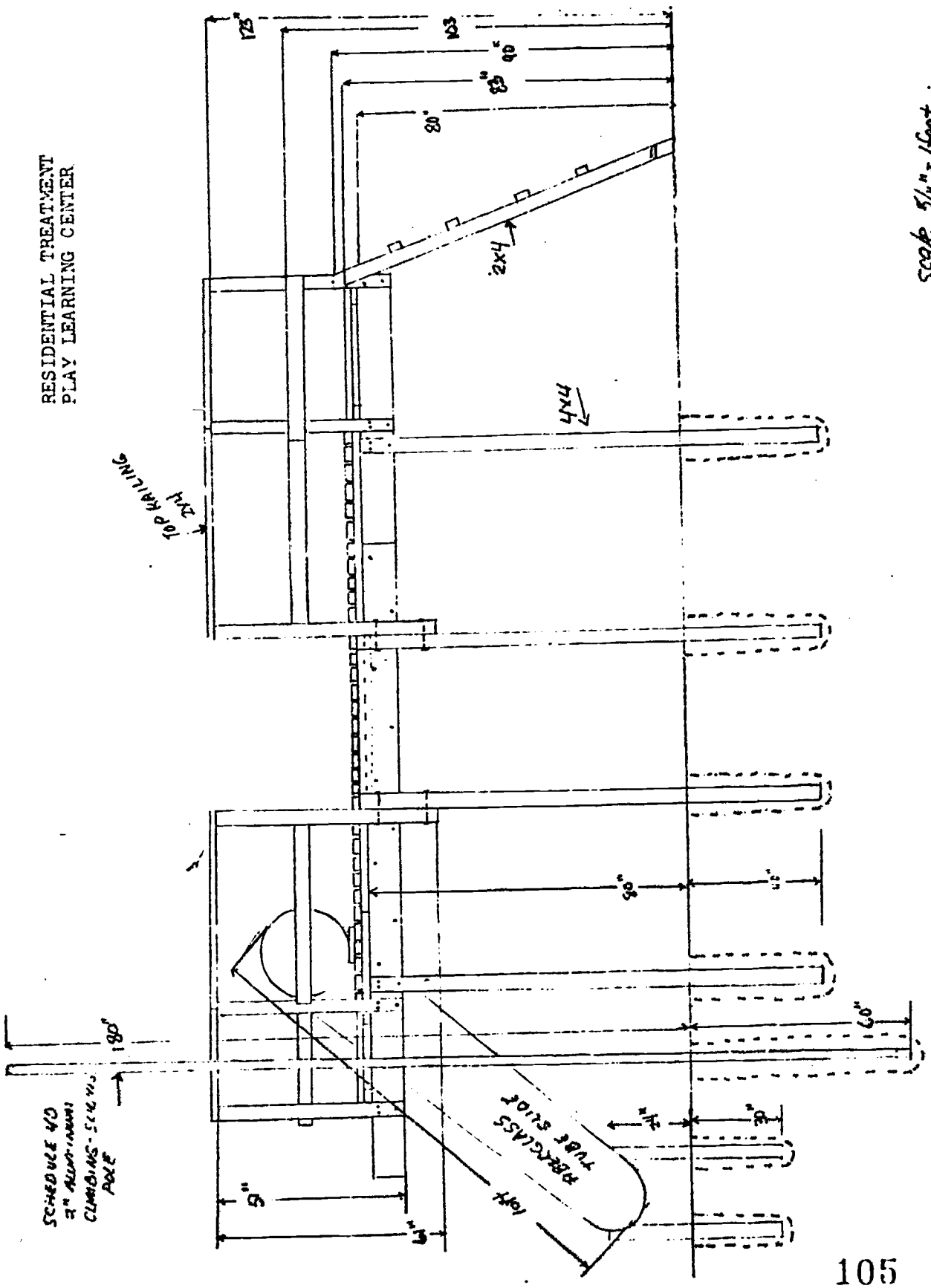


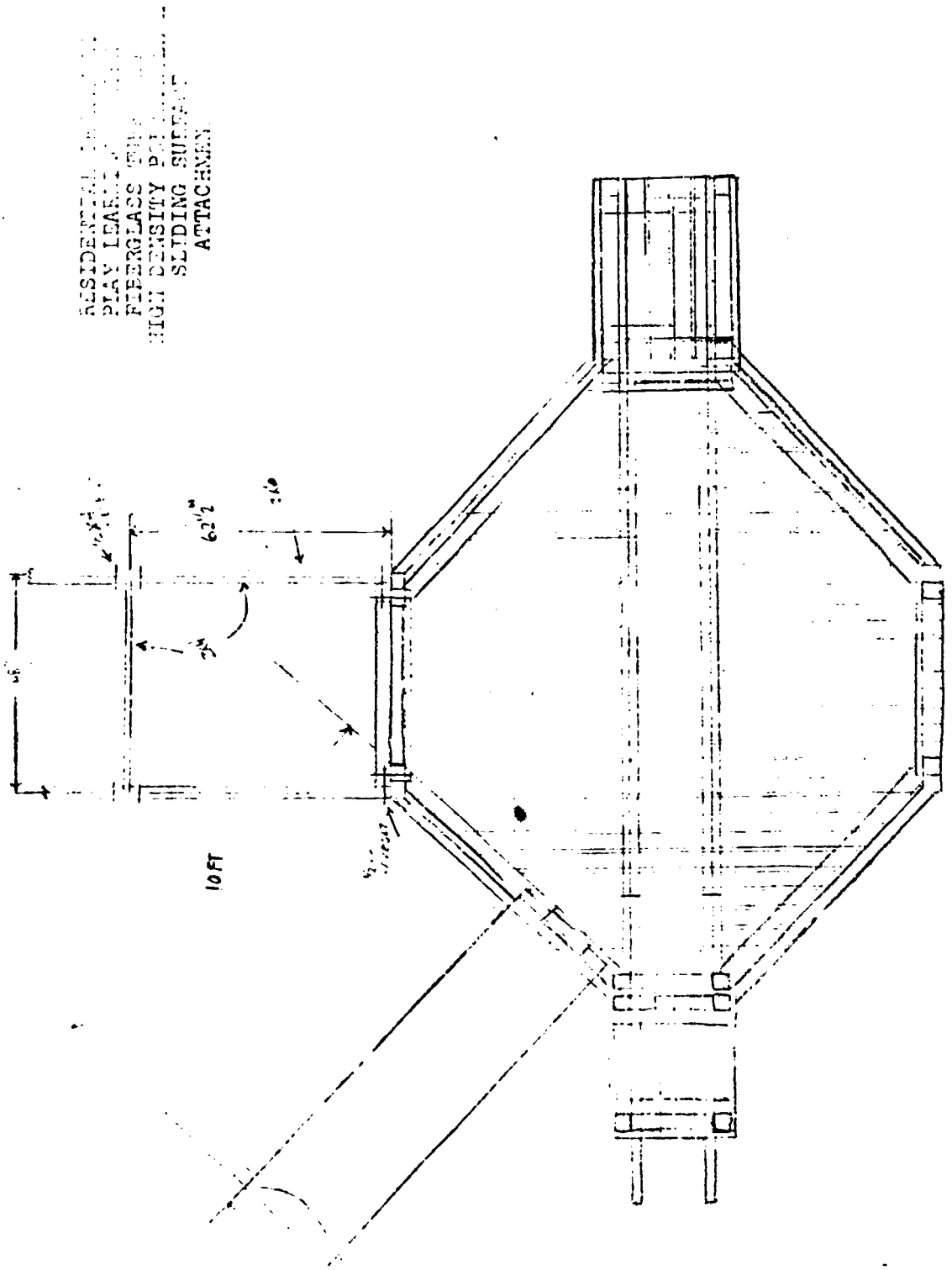
RESIDENTIAL TREATMENT
PLAY LEARNING CENTER



scale 5/16" = 1 foot

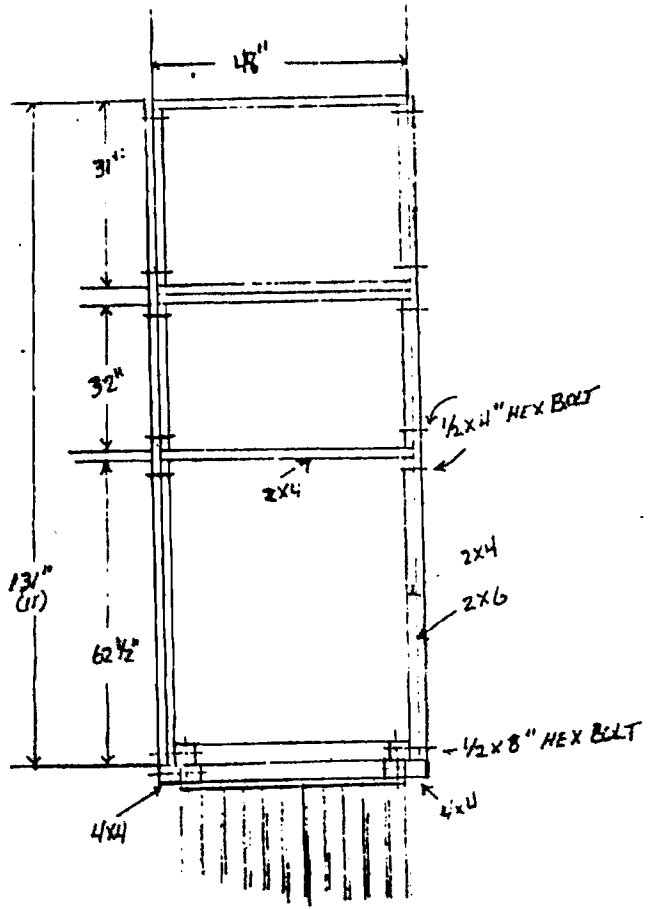
RESIDENTIAL TREATMENT
PLAY LEARNING CENTER

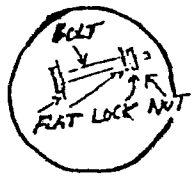




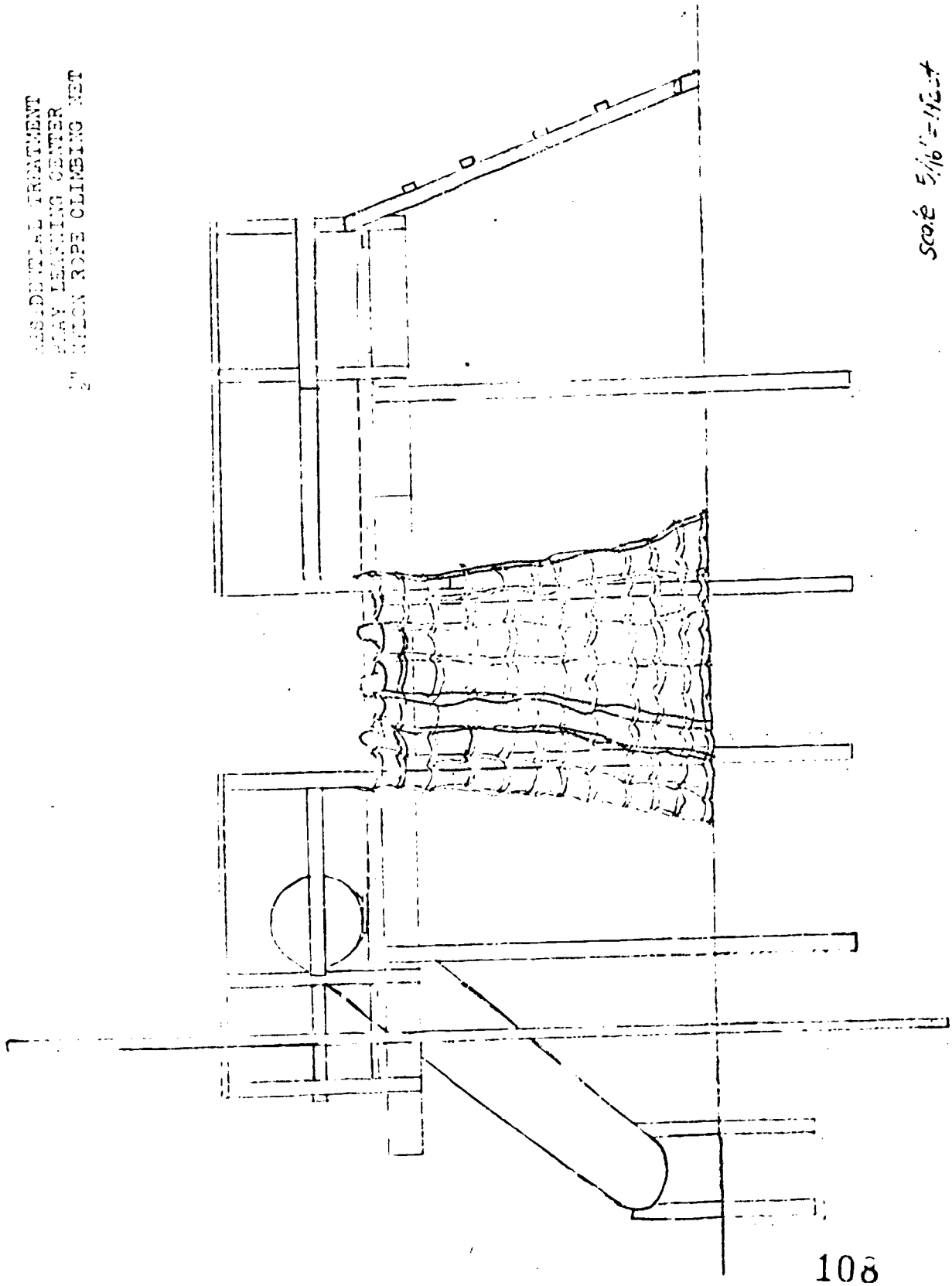
Scale 1/4"=1foot

RESIDENTIAL TREATMENT
PLAY LEARNING CENTER
HIGH DENSITY POLYETHYLENE SLIDE
UNDER SUPPORTS





scale 5/16" = 1 foot


...S DENTAL TREATMENT
...AY LEARNING CENTER
... ROPE CLIMBING NET
SCALE 5/16" = 1'-0"